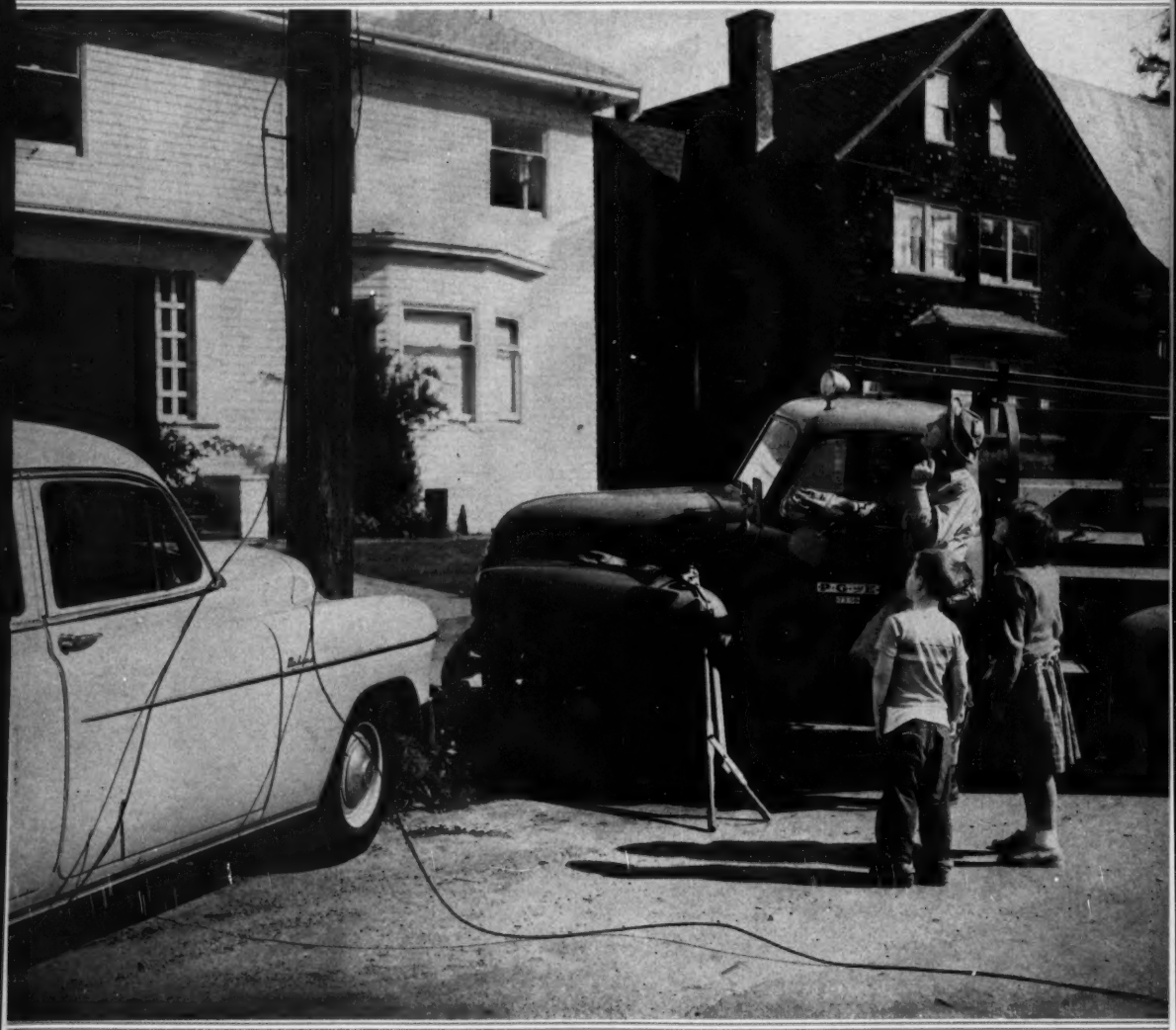
ELECTRICAL WEST Part 1

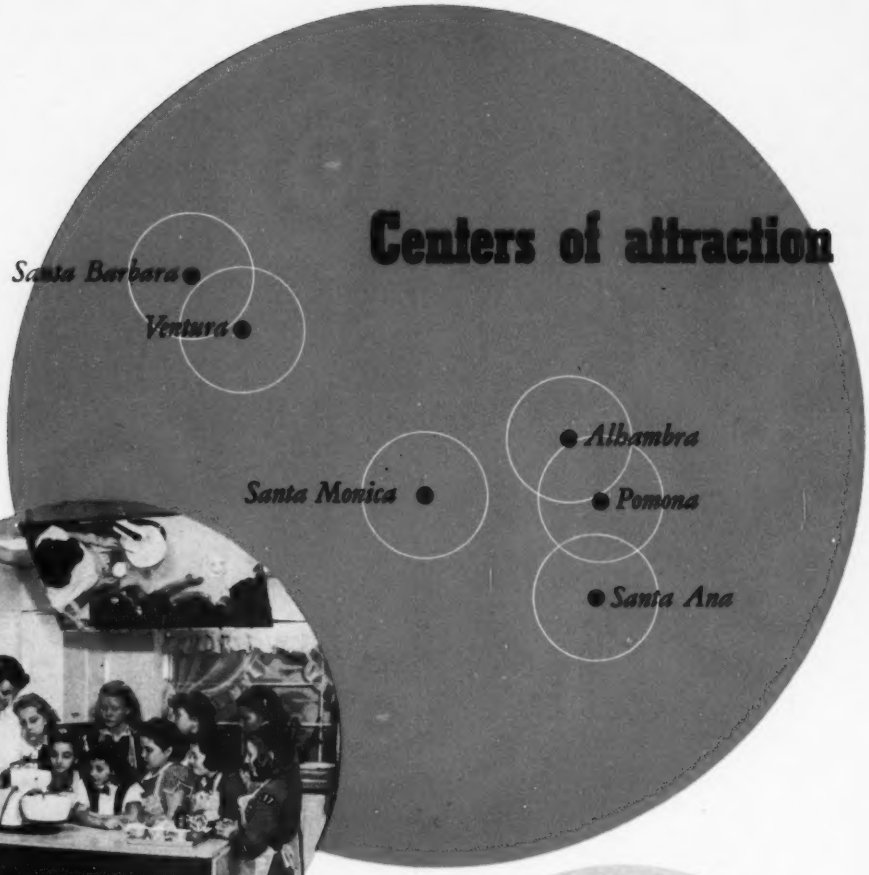
April 1952
50 Cents



Manufacturers' Directory Issue

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Centers of attraction

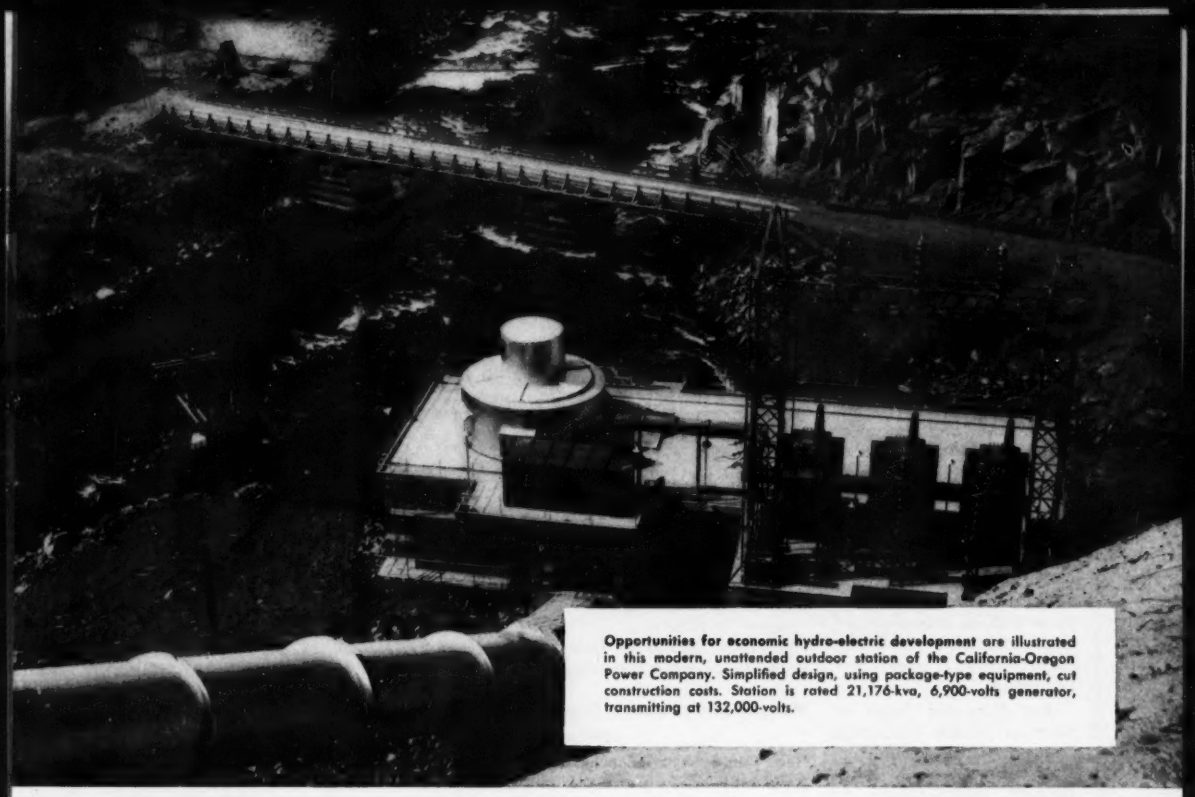


Here in Central and Southern California, cooperation between the Edison Company and appliance dealers has been selling electrical appliances for more than fifty years. But something new has been added. In fact *six* new somethings—six completely equipped strategically located Electric Living Centers, designed and installed by Edison Company.

To these Electric Living Centers, dealers send customers and prospects for complete and authentic information on uses, benefits and advantages of modern electrical appliances. Customers see them in actual operation, in demonstrations prepared and presented by Edison's skilled home economists.

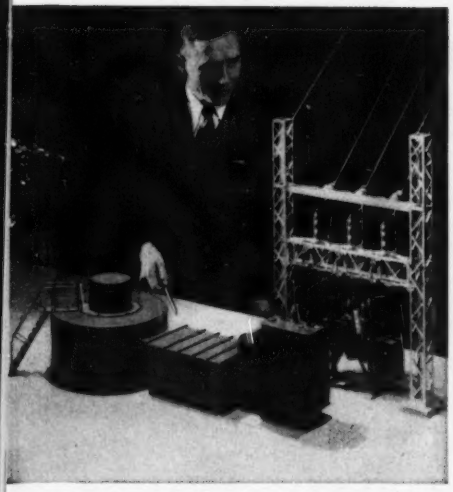
So now there's a new formula for appliance merchandising in this area: "Edison tells them—*and shows them*—and the dealer sells them!"

SOUTHERN CALIFORNIA EDISON COMPANY



Opportunities for economic hydro-electric development are illustrated in this modern, unattended outdoor station of the California-Oregon Power Company. Simplified design, using package-type equipment, cut construction costs. Station is rated 21,176-kva, 6,900-volts generator, transmitting at 132,000-volts.

Automatic stations spark new interest in development of marginal hydro-electric sites



One of several package-type electrical equipments for hydro-electric stations, this model is being inspected by J. B. McClure, Manager, G-E Power Generation Div. Equipment design is completely co-ordinated, simplifying installation.

With low operating costs and simplified modern construction, small hydro-electric stations can be profitable investments

At a time when larger and larger generating stations tend to hold the spotlight as an obvious answer to the nation's growing demands for power, electric utilities in widely separated parts of the country are showing marked interest in small, unattended hydro-electric developments.

The reasons may be found in the increased opportunities for economic construction and operation offered through modern, factory-assembled equipments and proved methods of automatic control.

Engineered by General Electric, compact, package-type electrical equipment for hydro-electric stations is readily adaptable to remote control automatic or semi-automatic operation.

Designed around a simple line-up of hydraulic turbine operated generator, metal-clad switchgear, power transformer and outdoor station structure, they can be shipped in a minimum of sub-assemblies to simplify installation and reduce expense. In many cases, advantage can be taken of low cost outdoor station construction.

Water power is one of the country's great resources. Modern engineering advances, typified in these dependable, factory-assembled equipments, will speed its development to the maximum possible economic limits. General Electric Company, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

301-186

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

APRIL 1952

SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. The all-industry magazine of progress, established 1887, and incorporating the "Electrical Journal," "Journal of Electricity, Power and Gas" and "Journal of Electricity." Contents copyright. Sixty-fourth year of publication

VOL. 108 NO. 4

ELECTRICAL WEST

George C. Tenney, Editor
W. A. Cyr, Associate Editor — Walter C. Heston, Engineering Editor
Peggy Boyer, Assistant Editor — John Coetz, Typography

Next Month

High-voltage direct current electronically rectified offers many advantages over other tests in determining the condition of insulation in rotating machines without breaking down or damaging the insulation under test. This subject will be discussed in the May issue.

Presentation of design features of the new Bridge River 345-kv line now under construction in British Columbia will prove enlightening.

For May we hope to have an article describing the adjustable-blade turbine design for a low-head pioneer hydro plant in Oregon City, Ore.

Properties of synthetic rubber compounds and thermoplastics as insulation and sheaths on electric cables will be discussed by the engineer for a large wire manufacturer.

There will be the usual presentation giving results of the government's snow survey, and forecast of water conditions in the West.

In lighting and wiring there will be several features, including an all-infrared cooking installation; low-voltage control in a new radio and television studio; electronic heating of sponge rubber.

Meeting reports, news letters and other regular features will round out another issue.

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Cover: Mobile radio gets quick action when trouble strikes. See story page 84.

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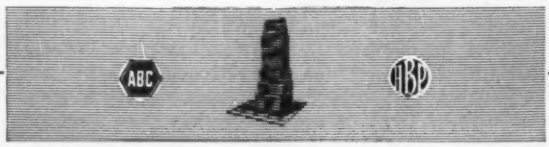

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UTILITY DATA SHOWS OUTSTANDING 99.94% PERFORMANCE RECORD FOR L-M VALVE TYPE LIGHTNING ARRESTERS

Six-year performance records of a large midwestern utility show that L-M valve type lightning arresters have an exceptionally good operating record. With a total of 41,175 service years, only 23 L-M arresters had Isolator* operations while in service—there was only one instance of radio interference from L-M arresters—and of 613 arresters brought into the shop for electrical testing, not one was found faulty.

Here are the records for the years 1945 through 1950.

Year	Arresters in Service	Isolator Operations in Service	Number Tested	Failed in Test
1945	3,286	5	0	0
1946	4,322	2	11	0
1947	6,020	2	137	0
1948	7,469	4	118	0
1949	8,686	3	186	0
1950	11,392	7	161	0
Total Arrester Service Years	41,175	23	613	0

23 ÷ 41,175 = .056% failure rate

This substantiates the claims that L-M engineers have always been able to make—that L-M arresters give remarkable protection, excellent performance, and long life with unchanging characteristics.

Testing Greatly Simplified. The Pyrex® glass housing of L-M valve type arresters allows you to "test by sight." You don't have to make an electrical test of every single arrester. Just look at the spark gap—any irregularities can be detected by sight. If the Isolator* is intact you know the valve element is okay. That's all there is to it—if you use L-M Pyrex-housed valve type lightning arresters.

Get Complete Details. For complete information on L-M Lightning Arresters, and details of visual test methods, ask the L-M Field Engineer, or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

LINE MATERIAL

Lightning Arresters

Complete Coordinated Equipment for Distribution Today

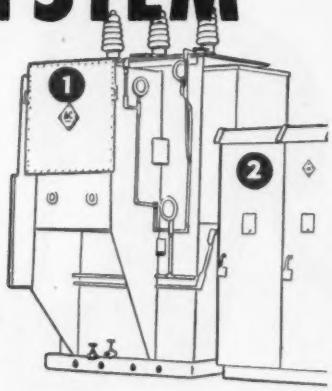
*L-M's "ISOLATOR," watchdog of arrester trouble, gives positive assurance against grounding feeders through damaged arresters, by disconnecting the ground lead from the arrester. (As shown in the operating company records above, in 41,175 arrester-years there were 23 Isolator operations, which provided this disconnecting service.)

80

MULTI-CIRCUIT
Unit Substations

GROW WITH YOUR DISTRIBUTION SYSTEM

① By Double Ending
② Adding Feeders
③ Increasing Transformer Size



Here's How Allis-Chalmers Substation Design Eases Future System Growth Problems

YOU CAN PREDICT your entire system load at some future date easier than you can predict that of a specific substation. A new housing development, a new industry, a new shopping center—each can make a major change in the load on one substation without greatly affecting the entire system. That's why substation design must be *flexible!*

Easy Field Assembly Speeds Expansion

Allis-Chalmers unit substations not only meet your immediate needs, but are designed to grow with the areas into which they are installed. They are designed for easy addition of feeders . . . easy double ending . . . and easy application of larger capacity transformers.

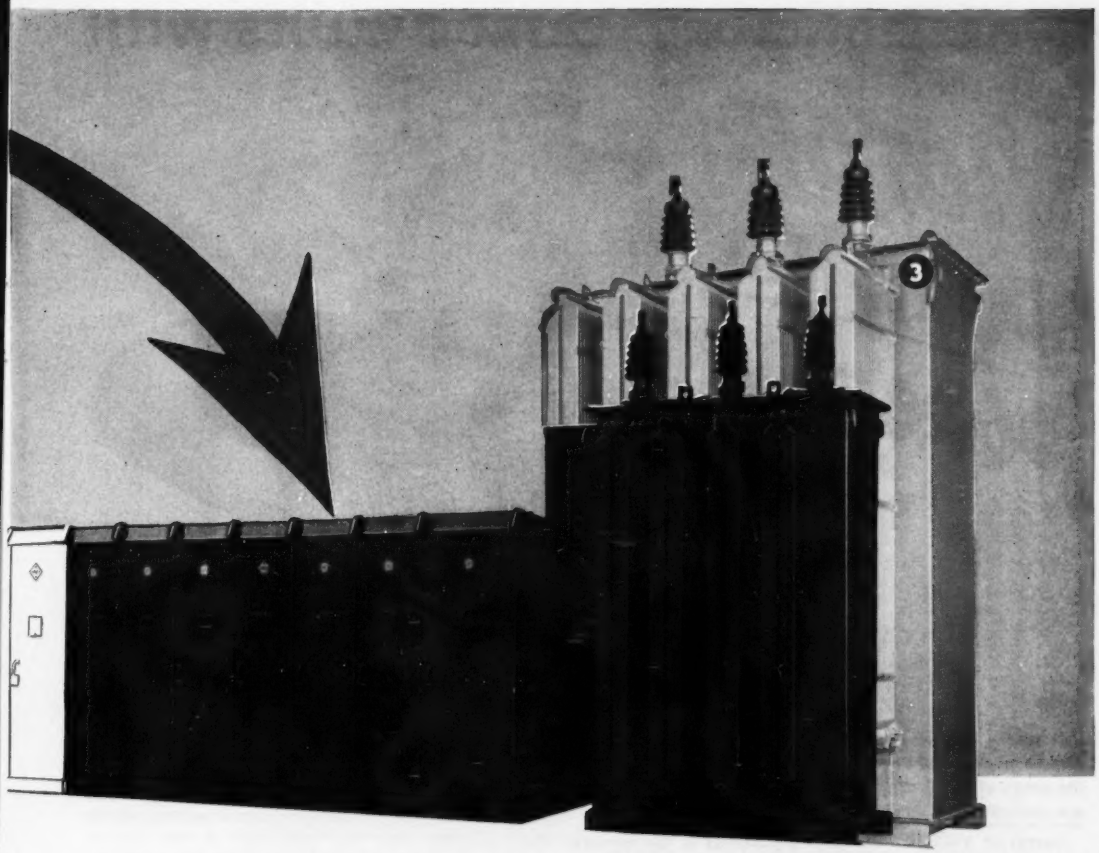
Allis-Chalmers Unit Substations are a convenient answer to the growing distribution problem . . . to the ever increasing demand for power and yet more power. They are simple to specify, neat and modern in appearance, and easy to expand.

You Save These Five Ways

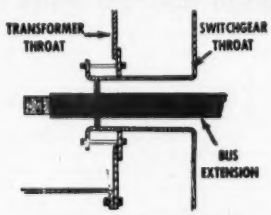
(1) Original equipment cost is low; (2) compact construction reduces space requirements and real estate costs; (3) pre-wired unit design speeds installation; (4) maintenance is quick and economical because of improved accessibility; and (5) you purchase only the equipment you need *now*, deferring additional expenses until load growth demands the expenditure.

For the full story on what Allis-Chalmers Unit Substations can mean in your distribution system, call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3585

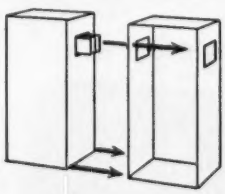
ALLIS-



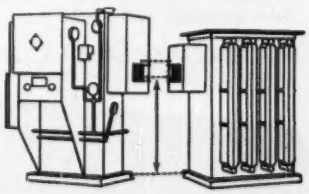
MCS Substations are Expandable These 3 Ways



1 **DOUBLE ENDING** is easy. Throat openings of transformer and switchgear are at exactly the same height. Bus connectors and transformer throat are flexible enough to permit realistic tolerances in concrete base construction. Silver-plated, pre-drilled bus extensions bolt together, are tape covered to speed field assembly.



2 **FEEDER UNITS** are easy to add because they are jig built. Each feeder cubicle is exactly like every other one. Bus extension openings, control wiring openings — even small screw holes — are pre-cut in jigs for perfect alignment. This uniform construction, plus two sides on every cubicle, makes field assembly easy.



3 **A HIGHER CAPACITY TRANSFORMER** — within the limits of breaker size and bus capacity — can easily replace the installed transformer. Standardized throat height on all A-C substation transformers, regardless of rating, permits one transformer to replace another without cutting or reforming the throat or bus.

CHALMERS

A-C ALLIS-CHALMERS

HIGHER PUNCTURE VOLTAGE VALUES WITH

VICTOR PURIFIED PORCELAIN

VICTOR NO. 900
SUSPENSION INSULATOR

Laboratory tests prove VICTOR *PURIFIED* PORCELAIN has 18% higher mechanical impact values, an improvement of 24% in the range of M & E strength values and oil puncture values that are remarkable (See charts at right!)

Secret of VICTOR *PURIFIED* PORCELAIN is the removal of mineral salts from water used in processing. Years of research in this field have reduced fluctuations in shrinkage and density and practically eliminated the formation of microscopic, glass-like impurities which, up to now, have prevented attainment of maximum strength and hardness. Result—the finest insulator porcelain ever made!

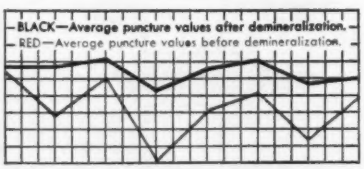
VICTOR INSULATORS, INC. • VICTOR, N. Y.

Specify VICTOR SUSPENSION INSULATORS

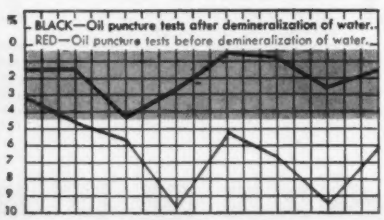
HERE'S PROOF!

Shown below are records of tests made on VICTOR 10" 15,000 lb. Suspension Insulators picked from production runs. These charts show test results of puncture under oil before and after demineralization of water. The first shows average puncture values of tests made and reveals a 7½% increase of average puncture values after water demineralization. The second shows percent average deviation of puncture values.

TEST RUNS OF PUNCTURE UNDER OIL



Average Puncture Values of Tests Run



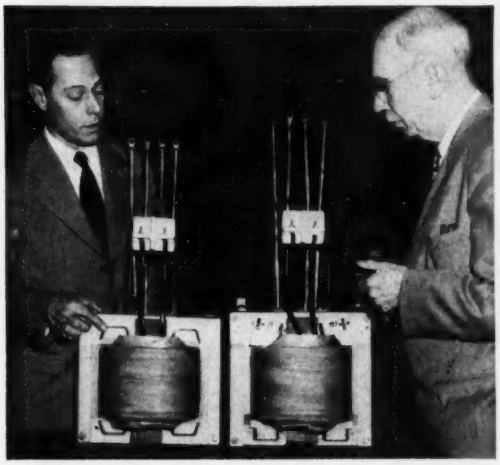
Percent Average Deviation of Puncture Values

KERITE
CABLE-GRAM
THERE'S AN IMPORTANT DOLLAR DIFFERENCE BETWEEN SERVICE AND MAINTENANCE: THE MORE SERVICE THE SELLER PUTS INTO HIS PRODUCT THROUGH QUALITY MANUFACTURE, THE LESS MAINTENANCE TIME AND EXPENSE THE BUYER HAS TO WORRY ABOUT.
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.
DAYS KERITE
KERITE CABLE
THE KERITE COMPANY
30 Church St., N. Y. 7, N. Y.
Offices also at 122 Michigan Ave., Chicago;
582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.

Now...new design makes G-E pole-type

LESS WEIGHT ON POLE. C. E. Sutton, Jr., Manager of Distribution Transformer Sales, points out material which will *not* have to be hung on pole, thanks to new design.

transformers even lighter, stronger



STRONGER, THOUGH LIGHTER INTERIORS result from improved clamping structures and coil supports. N. M. Case, Section Engineer, and E. D. Treanor, Manager Distribution Transformer Engineering, examine simple two-channel clamp with welded cross braces which replaces four-angle structure with bolted cross braces on unit at right.

WHAT FOUR WEIGHT REDUCTIONS HAVE MEANT. Unit on left is a pre-Spirakore distribution transformer. It weighs 505 pounds. It has an over-all height of 39 inches. Projected floor space is 21 by 22 inches. Comparable Spirakore unit on right weighs 335 pounds. Its over-all height is 35 inches. Projected floor space is 18½ by 20¾ inches.

Low losses retained—regulation improved—as Spirakore* transformer design chalks up fourth weight reduction

General Electric has again made important improvements in the quality of its core steel and its processing methods, permitting the redesign of most of its pole-type distribution transformers. The resulting copper savings are enough to build seven transformers where we could previously build only six.

Substantial weight reduction. The new units retain the low losses and high thermal capacity to take overloads, characteristic of previous designs. They also offer lower impedances, resulting in improved regulation. Physically, they're stronger than previous designs. Yet, they weigh substantially less:

AVERAGE REDUCTION IN MATERIALS WITH THE NEW DESIGN
(5000 volts and below)

- **10% reduction in total weight**
- **16% reduction in copper**
- **9% reduction in oil**
- **3% reduction in steel**

On a 2400-volt, 37½-kva unit the weight reduction amounts to 100 pounds. This means enough copper is saved to build a new-design 5-kva unit and enough oil for a new-design 10-kva unit.

Greater Short-circuit Strength. In the new design, clamping structures and coil supports have been simplified. . . strengthened. Support structures stay tight throughout treatment and life of the transformer. Tight coil supports prevent slippage between high- and low-voltage coils—increase short-circuit strength materially.

Continued leadership. The new design represents another of the many improvements that have helped maintain Spirakore transformer leadership since 1937. High impulse strength, Nitrile rubber gasket sealing, and long-life Melaglyp paint finish are some of the reasons why Spirakore transformers give extra years of service.

For complete information on these units write for GEA-4885, *General Electric Co., Schenectady 5, N. Y.*

*Registered trade-mark of the General Electric Co.

Spirakore transformers give extra years of service.

402-118

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

EDISON selects NICHROME* V WIRE

for new, high-accuracy, long life MINIATURE RELAYS

Edison's new space-saving miniature thermal time-delay relays, scarcely larger than a door key, are built to handle big jobs—accurately and dependably, day in and day out.

They offer the simplest, most trouble-free, and least expensive way of introducing delay periods into electric circuits. Thus they are ideal for control functions relating to cathode protection, motor starting, "hold-overs," overload protection, automatic cycling, and numerous applications where magnetic relays have hitherto been used.

Since accuracy of operation depends, essentially, upon the consistent performance of the extremely small heater, wire of this winding must be *exceptionally stable*—be capable of retaining its physical and electrical characteristics *indefinitely*.

Nichrome V alloy, unique product of Driver-Harris, fulfills these all-important conditions. With a temperature co-efficient of resistance that remains constant between 20°C. and 500°C.—a considerably wider temperature range than actually here involved Nichrome V assures uniform, precision performance. And being highly resistant to heat and corrosion, it assures *outstanding stability for a lifetime.*

This particular application serves to emphasize other desirable properties which make Nichrome V wire extremely suitable for heating, or resistance units required to occupy very limited space. For example: Only a few milliamperes of current are utilized by the Edison miniature thermal relay. The heater winding must, therefore, have high resistance in order to produce sufficient heat to deflect the bi-metal contact strip. The electrical resistivity of Nichrome V (650 ohms/cmf) permits a short length of one-mil-diameter wire to be used, thus saving space; and the high tensile strength of Nichrome V (200,000 p.s.i. at 20°C.) eliminates breakage in winding operation.

New Edison Time-Delay Relay — Model 207 Standard Voltages 115—27.5—6.32 Hermetically sealed. Vibration and shock proof. Ambient compensated −60°C. to +85°C. Wide range of delay periods available.

For products whose successful operation depends upon application of stable electrical alloys, highly resistant to heat and corrosion, you'll find Nichrome and Nichrome V offer *plus values* that are unequalled. At the present time, these alloys are on allocation; but if you will let us have your specifications, we shall be glad to make recommendations and serve you to the best of our ability.

Nichrome* is manufactured only by

Driver-Harris Company

Western Representative: **ANGUS-CAMPBELL, INC.**

1114 Valencia St., San Francisco 449 So. San Pedro St., Los Angeles

Main Office and Plant: HARRISON, NEW JERSEY

*T.M. Reg. U.S. Pat. Off.

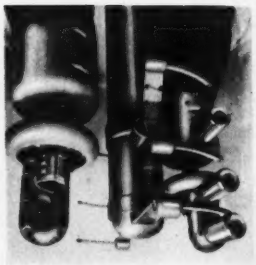
MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

Advanced Protective Performance ...Extreme Simplicity of Design

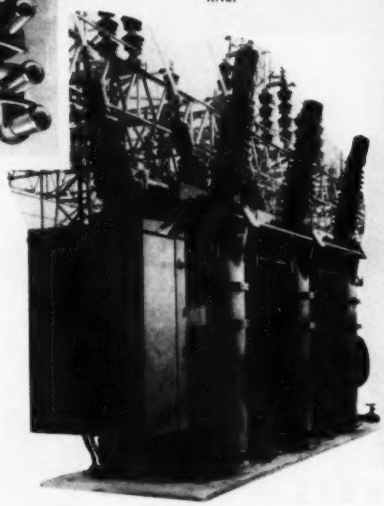
138- to 230-kv 3-cycle
115-kv 5-cycle
(Also other styles, 7.5 kv and up)

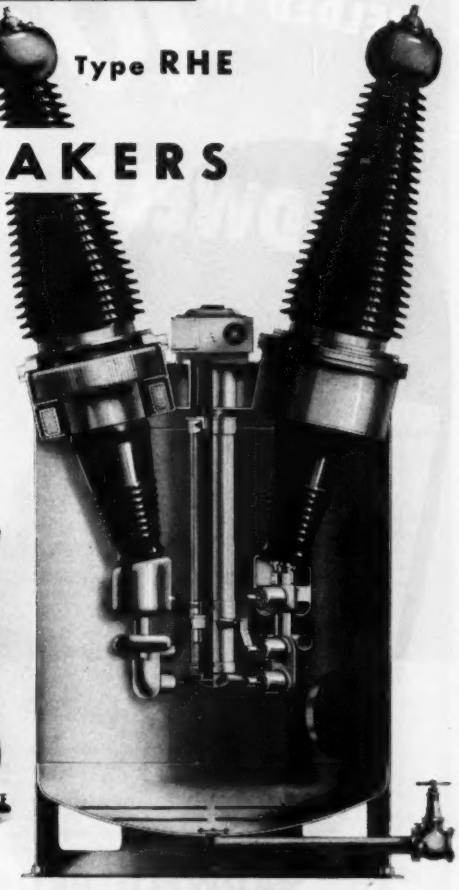
PACIFIC ELECTRIC Type RHE
HIGH-SPEED RECLOSING
CIRCUIT BREAKERS

to 10,000,000 Interrupting Kva (at 230 kv)



At right: Sectional Elevation of 196/230-kv Type RHE.





Above: Interior of Tank, Showing Blades and Interrupters—Circuit Breaker Open.

At right: Type RHE in OKLAHOMA (138 kv).

NEMA and ASA STANDARD

A ONE-PIECE Six-break rotary blade unit is all that moves within the tank of a PACIFIC Type RHE oil circuit breaker.

Interrupters are of simple self-pressurizing type; their exceptional performance is due to improved utilization of directed oil flow and high speed of developing open-gap distance. The configuration of interrupter assemblies also permits use of the simplest method of obtaining voltage division between the six breaks in series per pole—capacitance grading shields.

Many fault interruptions on a symmetrical or asymmetrical (A.S.A.) basis—including a series of tests extending to 9,600,000 kva at 240 kv (A.S.A.)—confirm the ratings of these interrupters.

These and other advanced features contribute to low maintenance cost, ease of adjustment, and reliability of operation.

Write for Catalog 585

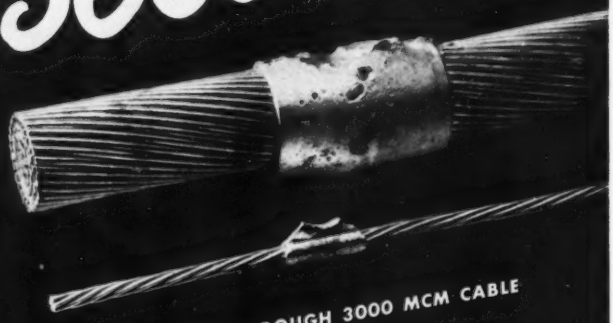
PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • 4500 HARRISON STREET, GARY 10, INDIANA

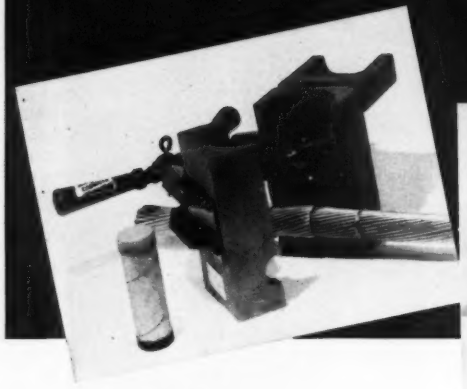
Since 1906

SALES OFFICES or AGENCIES in PRINCIPAL CITIES

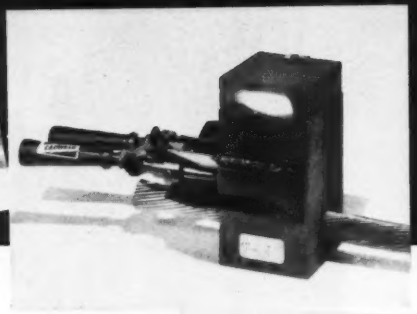
WELDED IN 10 seconds BY CADWELD*



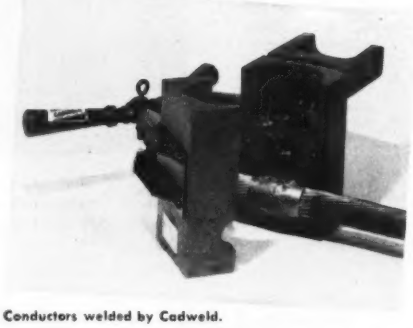
#6 WIRE THROUGH 3000 MCM CABLE



Conductors placed in Graphite Mold.



Cartridge dumped in crucible and ignited with a flint gun.



Conductors welded by Cadweld.

*THE CADWELD PROCESS

A controlled reduction of copper oxide with aluminum producing molten copper at approximate 4000° F.

A CADWELD CONNECTION

- Cannot loosen or corrode.
- Cannot be damaged by excessive overload.
- Has current carrying capacity equal to that of original conductor.

Light weight portable equipment—ideal for field work.

CATALOG ON REQUEST

ERICO PRODUCTS, INC.
2070 EAST 61 PLACE • CLEVELAND 3, OHIO

ALLIS-CHALMERS INSTRUMENT TRANSFORMER

Accuracy Pays Off!

TWO WAYS

1 Assures correctness of customer's power bill

2 Helps determine power supplier's income

AS A METERING SUPERINTENDENT or purchaser of instrument transformers, you know the full importance of high quality equipment in power metering. You know, for example, that large errors in watthour and demand meter records could result from just a small error in your instrument transformer.

Accuracy in instrument transformers pays off for both the user and the supplier since it determines: (1) the amount of power for which your customer is billed, (2) the income to the supplier for that service.

ACCURACY MEETS ASA STANDARDS

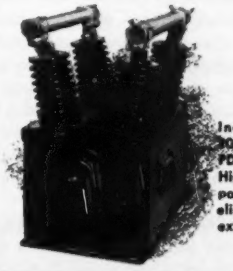
You get *accurate* metering with any Allis-Chalmers current or potential transformer or metering outfit. Each one is designed and built to meet ASA standards . . . and has the best combination of engineering and materials that 50 years of experience can provide.

New developments and technical improvements are being applied to many Allis-Chalmers instrument transformers. The new Type SPW potential transformer, for example, is smaller, lighter and more compact. As a step toward longer life, the coils are corona-protected. The hermetically sealed, all-welded tank protects insulation and oil from sludge formation.

Contact your nearby Allis-Chalmers district office for details on any instrument transformer in this wide line. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 61B7168. A-3629

Outdoor potential transformer for heavy duty metering service, Type SPW. Ratings up to 69 kv. Compact, lightweight design. Also available in single bushing design for line to ground connection.

Outdoor current transformer for heavy duty metering, Type KO. Ratings up to 15 kv and 800 amperes. Solid compound guards windings and insulation from air and moisture. Mounts in any position, horizontally or vertically.



Indoor potential transformer, 900 va fused or unfused, Type PD. Ratings up to 14,400 volts. High thermal capacity. Compound filled under vacuum... eliminates air and moisture and extends insulation life.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

now! Rome

The SUPERIOR Heavy-Duty Steel Conduit With These Exclusive Features:

- ***Cold formed from sheet steel***
- ***Electrically welded seam***
- ***Hot-dip galvanized by Sendzimir* process***

Now, with the introduction of Rome·RIGID you can look to Rome Cable for all conduit requirements. Manufactured to the same high quality standards as Rome·EMT, thin wall conduit, Rome·RIGID *is new . . . is different.* It is the *only* rigid steel conduit cold formed directly from shot-blasted carbon steel sheet . . . providing the cleanest possible surface without oxidation and scale as in the case of hot formed pipe. It is the *only* rigid steel conduit welded electrically . . . providing superiority in uniformity of ductility, strength, dimensions and concentricity. Further, it is the *one and only* rigid steel conduit hot-dip galvanized by the patented Sendzimir* process . . . the last word in superior zinc coating on steel.

* Under license agreement, Rome Cable is the first and only manufacturer to apply the famous Armco method of zinc coating sheet steel to the hot-dip galvanizing of rigid steel conduit.

In the Sendzimir process, the formed pipe is precisely heated, uniformly oxidizing inside and outside surfaces and completely burning off all possible surface grease or dirt. Conveyed into another furnace under a carefully controlled reducing atmosphere, the oxide coating is reduced to virgin metal. Actually, the furnace atmosphere of hydrogen combines with the oxygen in the oxide coating to turn the pipe surface to a mirror brightness of stainless steel. Here is the cleanest metal surface known. Cooled in the same atmosphere to a heat just above the temperature of the zinc bath, the bright pipe enters the molten zinc without ever coming in contact with air. Its virgin clean surface is instantly coated with pure zinc, inside and out.

The Sendzimir process produces a superior zinc coating for long life protection. It eliminates flux which is often trapped and eventually eats its way through the zinc. It provides a perfect and uniform bond between bright, clean, raw metal and molten zinc. It is a process that has been used on sheet steel by Armco for fourteen years in establishing a standard of quality unrivalled in the steel industry.

"Clean as a Shot Gun Barrel"

With its clean enamel finish over a galvanized surface, Rome • RIGID presents a mirror smooth interior for easy fishing of wires with no burrs or rough edges. Like its companion Rome • EMT, thin wall conduit, Rome • RIGID is known for being as "clean as a shot gun barrel."

Rome • RIGID is available in 10 foot straight lengths, as well as 90° elbows. Sizes are ½", ¾", 1", 1¼", 1½" and 2". Fully approved by Underwriters' Laboratories, Inc., it meets all requirements for safe, heavy-duty steel raceway . . . plus uniformly high quality. See your electrical wholesaler or call your nearest Rome Cable office today.

It Costs Less To Buy The Best!

ROME CABLE
Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

ROME CABLE ROME, N.Y.

WESTERN SALES OFFICES AND WAREHOUSES

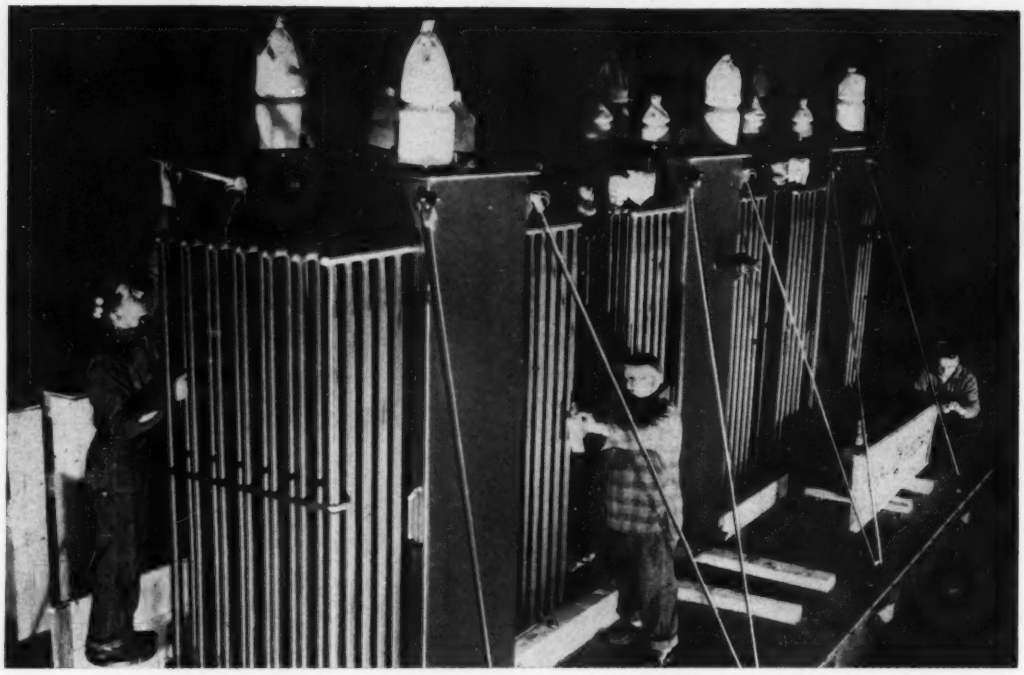
SALT LAKE CITY 1, UTAH
230 South 4th West St.

LOS ANGELES 21, CALIF.
2038 Bay Street

SAN FRANCISCO 24, CALIF.
1100 Selby Street

SEATTLE 4, WASH.
3404 Fourth Ave., So.

DENVER 3, COLO.
1160 Elati St.



89 Different Electric Utilities Specified RM* Transformers in 1951...gain of 15.6% over 1950

RM designs now conform to new ASA Standards... faster shipments, lower prices are retained

Our records for 1951 show that 89 different electric utilities capitalized on the shorter shipments at lower prices obtained by specifying General Electric's RM power transformers. This represents an increase of 15.6% over the 77 utilities that placed RM orders in 1950.

In terms of actual volume, RM units accounted for 59.2% of all orders for power transformers in the RM range—convincing evidence of their wide acceptance, and of the flexibility in application they offer.

This year we anticipate even wider acceptance of RM transformers which now conform to the new Proposed Standards for Transformers, recently adopted by the users and manufacturers represented on the ASA C-57 Committee. These new RM ASA transformers offer the same price and delivery advantages as previous RM designs.

For complete information on the new ASA Standards, and on RM ASA transformers, see your local G-E representative. Or write to *General Electric Company, Schenectady 5, New York.*

*RM stands for "Repetitive Manufacture." By using standardized construction methods, General Electric builds RM power transformers more economically—delivers them faster. RM designs are available in ratings 10,000 kva and below and up to 69 kv, with many optional features.

401-29

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

WANT TO "SHRINK" YOUR ALUMINUM CABLES?

It is easy to do if you know how. Here's how. To operate at the same temperature, your insulated aluminum cable would have larger size conductors to compensate for the reduced conductivity of aluminum. It follows then that your conduits, fittings and connectors would all have to be larger than for copper.

But if you buy a cable having approximately the same size aluminum conductor that you would ordinarily buy if you were using copper, the aluminum cable will run considerably hotter than a copper cable would under the same load. So instead of using conventional insulations, which are seldom rated more than 140 F. (60 C.), specify Simplex-Anhydrex XX insulation. This will help overcome the heat problem, where voltage drop will permit, because Anhydrex XX is rated at 176 F. (80 C.).

Simplex-Anhydrex XX insulation will operate at temperatures up to 176 F. (80 C.) in either wet or dry locations at voltages up to 17,000. That's how you shrink aluminum conductors.

If you must use aluminum because of the copper shortage, let our engineers help you with your problem.

We would be more than happy to give you the latest specification data on Simplex-Anhydrex XX insulation. Simply send your request to the address shown below.

Simplex-Anhydrex XX is a product of Simplex Research.

SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

Reduce inventories, cut costs, with new BullDog Vacu-Break Safety Switch Line

New BullDog *Master Line* cuts out duplication. Just 37 Type A switches now let you fill any Type A, C or D application *at C prices!*

Savings! Easy handling! Extra safety! They're all yours with the new, *standardized*, streamlined BullDog Vacu-Break Master Safety Switch line. Now, only 37 nonduplicating Type A switches fill any possible A, C or D requirement. They replace hundreds of confusing catalog numbers, let you reduce inventories, cut costs. And, because they are mass-produced and standardized, these Type A switches sell *at C prices* — a value unmatched by anyone. Check all the tremendous advantages this new line offers you, below. And place your *next* safety switch order with your local BullDog supplier.

LOW PRICE . . . a Type A switch at Type C prices!

NEW VERSATILITY . . . only 37 Type A devices fill any A, C, or D application. Each switch replaces any one or several formerly stocked!

LOWER INVENTORIES . . . fewer items to stock; a more *balanced* inventory with less investment!

SAVINGS IN SPACE . . . no duplicating items to tie up storage space!

SIMPLE TO ORDER . . . only 37 catalog numbers instead of hundreds. Less time wasted on long, confusing catalog lists!

EASY INSTALLATIONS . . . simplified mounting, anywhere. Ample knockouts and generous wiring space for savings in time, materials!

TOP PERFORMANCE . . . self-aligning Clampmatic Contacts give unmatched quick, positive, *bolt-tight* connections!

LESS MAINTENANCE . . . Exclusive Vacu-Break protection practically eliminates burned or pitted contacts.

GREATER SAFETY . . . Vacu-Break chamber smothers arcs instantly, protects against high contact temperatures.

HIGH QUALITY . . . listed by Underwriters. Quality-engineered and -built throughout!

For full details on this revolutionary safety switch line, see your BullDog Distributor or write for Bulletin 514.

BULLDOG

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

1902-1952 . . . SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS

CONSULT THE FOLLOWING PACIFIC COAST REPRESENTATIVES

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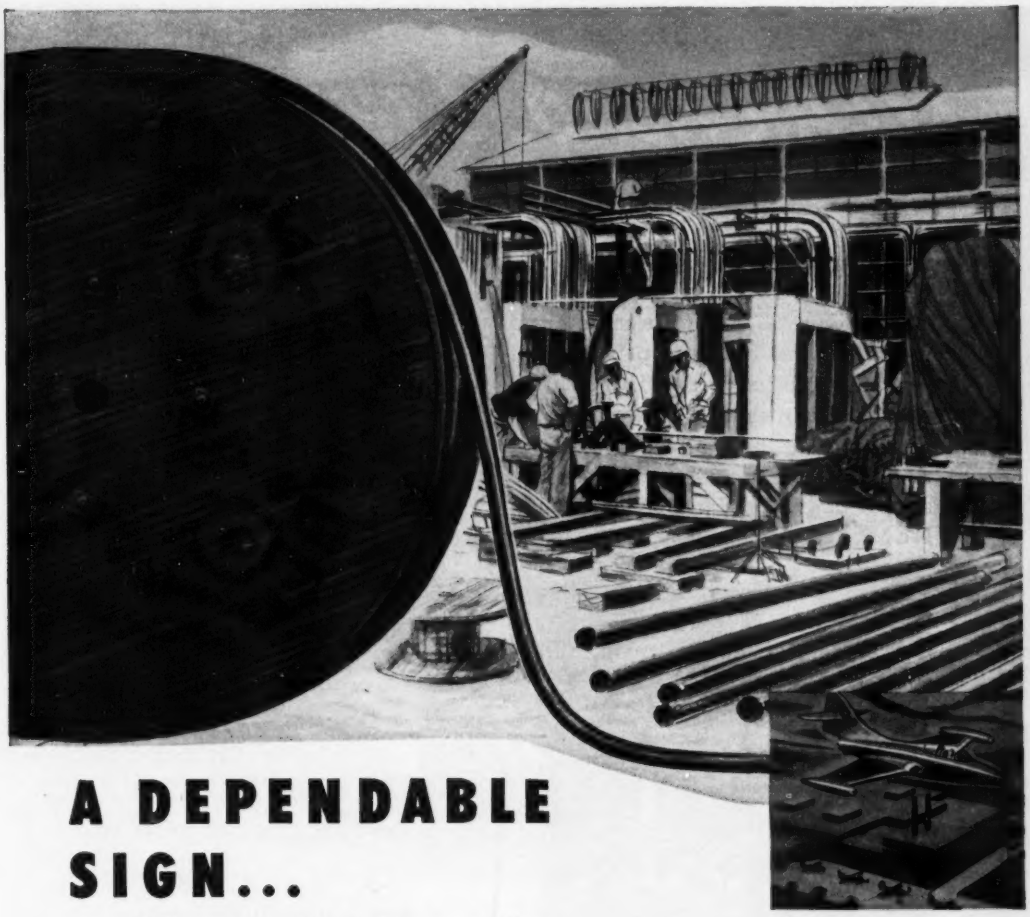
Portland 12, Oregon

Safety Switchboard Company
1445 Stevenson Street Tel. Hemlock 1-2470
San Francisco 3, Calif.

Paul L. Mullenbach Co.
3008 E. Olympic Blvd. Tel. Angelus 9-8101
Los Angeles 23, Calif.



A DEPENDABLE SIGN...

that America is expanding

Thanks in great part to you who harness electricity, America is expanding rapidly in the face of world tension.

As America strengthens its defenses, the YELLOW TRIANGLE REEL and the stack of Triangle conduit become more and more familiar sights. Engineers and contractors—demanding quality wire, cable and conduit—know that ***YOU CAN DEPEND ON TRIANGLE and on the ELECTRICAL DISTRIBUTOR.***

TRIANGLE CONDUIT & CABLE CO., INC.

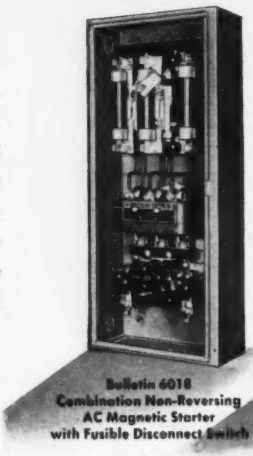
NEW BRUNSWICK, NEW JERSEY

IT MUST BE RIGHT

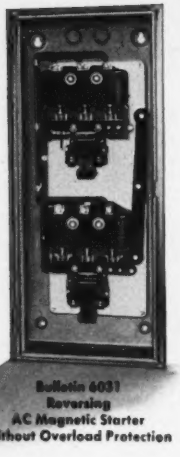
"Glazon" Building Wire • "Glazon" Non-Metallic Sheathed Cable • Control Wire • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power & Parkway Cables • Bare Wire • Rigid Conduit Hot-Dipped Galvanized & Black Enameled • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit.

CLEAR ACROSS THE BOARD . .

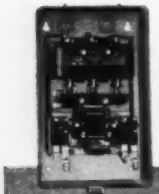
CLARK Type "CY" starters, sizes 2 and 3—employing the new principle of arc interruption—are offered in a wide range of models, for every application within their horsepower limits. A few of the many available are shown here. Enclosure styles include NEMA Types 1, 1A, 4, 5, 7 and 9.



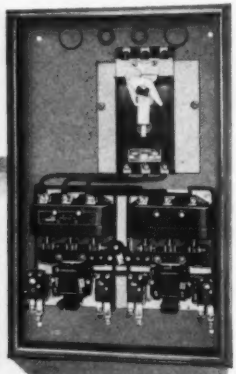
Bulletin 6018
Combination Non-Reversing
AC Magnetic Starter
with Fusible Disconnect Switch



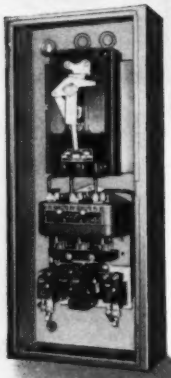
Bulletin 6031
Reversing
AC Magnetic Starter
without Overload Protection



Bulletin 6013
Non-Reversing
AC Magnetic Starter



Bulletin 6060
Combination Multi-Speed
AC Magnetic Starter
with Circuit Breaker



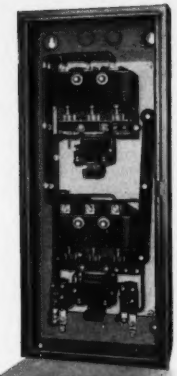
Bulletin 6020
Non-Reversing
AC Magnetic Starter
with Air Circuit Breaker

CLARK Type "CY" Sizes 2 & 3 —the starter with the revolutionary new arc-quenching principle.

The arc is extinguished by the effect of blow-out coils, *concentric with the contacts*. The steel arc chamber and center stud (colored blue in sketch at right) form the magnetic field which rotates the arc—either lengthening or confining it. Since the arc moves continuously on the contact surfaces, burning and pitting is minimized and contact life greatly increased.

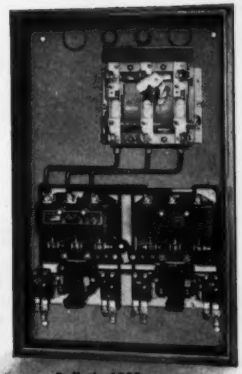
THE CLARK CONTROLLER CO.

. . . CLARK Type "CY" AC MAGNETIC MOTOR STARTERS



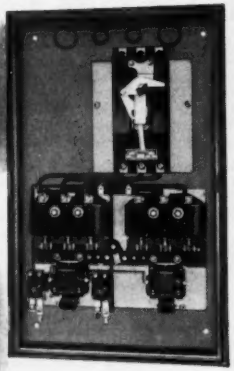
Bulletin 6030
Reversing AC
Magnetic Starter

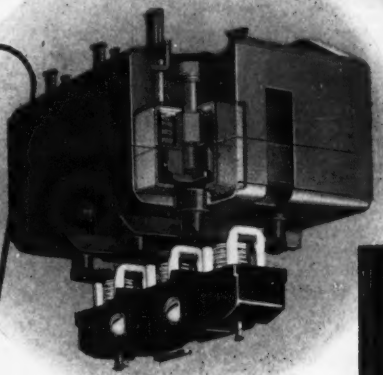
Every CLARK Type "CY" Starter gives you the extra protection of "Mill-Type" heavy-duty construction, *plus* the use of strong multi-turn magnetic blowouts in sizes 2 and 3, *plus* twin-break contacts of special silver alloy, *plus* advanced design with many exclusive features to improve efficiency and reduce maintenance.



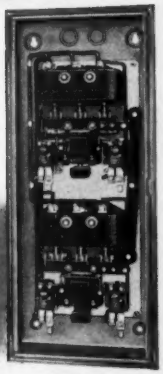
Bulletin 6058
Combination Multi-Speed
Magnetic Starter with
Safety Switch

Bulletin 6040
Combination Reversing
AC Magnetic Starter
with Air Circuit Breaker

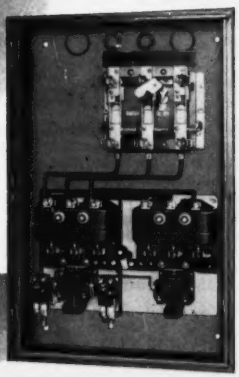




Working Heart of the CLARK Type "CY" Starter with cut-away showing magnetic circuit, arc shield and blow-out coil.



Bulletin 6050
Multi-Speed AC
Magnetic Starter



Bulletin 6038
Combination Reversing
AC Magnetic Starter
with Disconnect Switch

If your plant uses AC motors, it will pay you to learn how CLARK Type "CY" starters can insure production and cut maintenance costs. Write for complete details.

ENGINEERED ELECTRICAL CONTROL
1146 EAST 152ND ST., CLEVELAND 10, OHIO

CROUSE-HINDS High Efficiency

LIGHTING EQUIPMENT...

Type EVF Explosion-Proof and Dust-Tight
Fluorescent Lighting Fixtures
1, 2, 3, or 4 -Lamp

. . for Hazardous Locations

Crouse-Hinds explosion-proof lighting fixtures exceed the requirements for service in highly explosive atmospheres. They are designed to operate at a temperature below the ignition temperature of the gas-air or vapor-air mixture. They are so strong that they will resist internal explosions without damage and so tight that they will prevent the escape of flames or burning gases which might ignite the surrounding atmosphere.

Crouse-Hinds dust-tight lighting fixtures assure safety in locations that are hazardous because of the presence of combustible dust.

. . . for Wet and Corrosive Location

Crouse-Hinds vaportight lighting fixtures are ideal for use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

Hundreds of industrial lighting fixtures are listed in Crouse-Hinds Condulet Catalog.

. . . for Protection

Sabotage thrives in darkness. The most reliable and cheapest form of protection against night prowlers is LIGHT! Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, killing darkness and shadows and compelling everyone to be more visible at night than in broad daylight.

The protective power of light should be used in all important municipal and industrial locations. The floodlighting of industrial plants serves a double purpose. It helps to boost production in addition to the security it provides.

Send for your copy of Bulletin 2565, "LIGHT! Protect Your Property."

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
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CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

Now plastic tape helps turn night into day!

See that compact base? It supports one of the new aluminum-pole fluorescent street lights recently installed in Schenectady, N. Y. How would you insulate 5000 volt lead-ins to ballast transformers in a tight spot like that? General Electric Company did it with "Scotch" Electrical Tape No. 22, and the results are completely satisfactory. Here's why it works so well:

Plastic tape combines extra-high dielectric strength with thin caliper. That means it takes less room than conventional insulating tapes to do a better job.

And it does a better job because it resists water, prevents shorting. Acids, oils and alkalies don't affect it, either. The stretchy plastic backing forms a tight seal over odd shapes and curves—moisture is kept out for good! Try it yourself and see. Your wholesaler can supply a variety of widths. Order today!

QUICK FACTS about "SCOTCH" Electrical Tape No. 22

- **HIGH DIELECTRIC**—it's over 10,000 volts.
- **TOUGH**—plastic backing resists weathering, sunlight, acids, oils, alcohols, alkalies.
- **STRETCHY**—conforms snugly to any surface.
- **THIN CALIPER**—only .010 inch thick.

Minnesota Mining & Mfg. Co.
Dept. EP-42, St. Paul 6, Minn.

Name.....
Firm.....
Address.....
City..... Zone.....
State.....

SCOTCH BRAND Electrical Tape No. 22

FREE BOOKLET gives you physical and chemical properties of four of the many "Scotch" Electrical Tapes. Use coupon above, or mail a postcard today! Address: Minnesota Mining & Mfg. Co., Dept. EW-32, St. Paul 6, Minnesota.

3M COMPANY

The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining & Mfg. Co., St. Paul 6, Minn.**—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives.

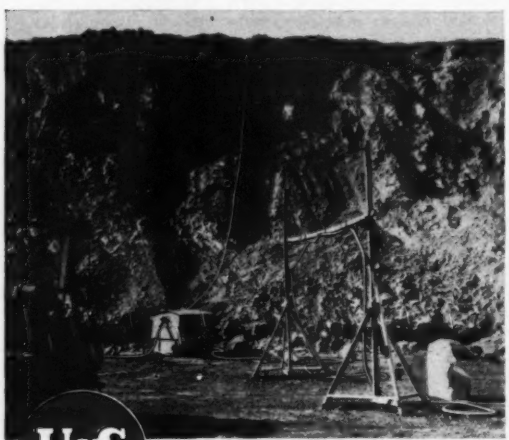
General Export: 270 Park Avenue, New York 17, N. Y. In Canada: London, Ont., Can.

the spike test proves it!

PS Shielding*

American PS Shielded Cables are perfect for aerial lines. Tree trimming is practically eliminated. Corona troubles vanish . . . along with television and radio interference.

Here's a good example of the way PS Shielding prevents corona formation. The conductor on the left is insulated with unshielded "ozone-proof" rubber. But the PS Shielded Cable on the right is completely free from corona.



USS

PS Shielding is so flexible, light and small that it is easy to manhandle over support rigs in the most rugged country.

PS Shielding provides an extra margin of safety when cable must be dragged over sharp rock and when it must be handled by workers.

UNITED STATES STEEL

by itself is a safety measure

*an original development of American Steel & Wire Division

● There's an easy way to prove the effectiveness of PS Shielding. Just drive a spike through the PS conducting rubber tape into the copper conductor *without touching the ground wires.* Your breakers will trip every time, proving that PS Shielding *alone* is an outstanding safety measure for the protection of all who handle your cable.

Naturally, the PS grounded tapes can't carry heavy currents, so they're usually used in combination with ground wires. But PS Shielding will easily handle the circumferential current of the cable. In other words, it will do everything that metallic shielding will do *with these added advantages:*

Prevents Corona Discharge—PS Shielding is so flexible that it never pulls away from the insulation. This is in sharp contrast to metallic shielding which often separates from the insulation when the cable is bent. Each of the resulting gaps is a serious danger point since it may cause spark discharge plus the inevitable corona and ozone formation.

Easy to Splice—PS Shielding is available in rolls. For most splices you can apply your shielding to the splice just like ordinary insulating tape.

Reduces Bulk—PS Shielding has less bulk and weight than metallic shielding. Consequently, the cables are lighter, smaller, and in general—easier to handle.

Increases Cable Life—PS Shielding is so smooth and pliable that it won't chafe the insulation or jacket. There are no fine wires to break when the cable undergoes hard usage.

For the full story on PS Shielded Cables, get in touch with your nearest American Steel & Wire Division office.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY
GENERAL OFFICES, CLEVELAND, OHIO

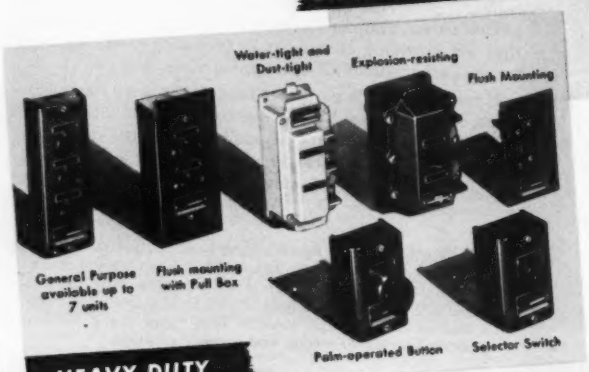
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S American Electrical Wire & Cable

UNITED STATES STEEL

This COMPLETE Line meets every need for Pushbuttons

STANDARD DUTY



HEAVY DUTY

Name your pushbutton requirement—there's a Square D unit to do the job, exactly. Three complete lines . . . standard duty, heavy duty, and oil-tight heavy duty . . . each providing a wide range of operators, stations, and circuit combinations.

Nine Unit Station (available 3, 6, 9, 12, 16 units)
One Unit Station
Two Unit Station
Three Unit Station
Four Unit Station arranged for horizontal mounting

OIL-TIGHT HEAVY DUTY

Write for Pushbutton Bulletins which give complete details. Address Square D Company,

4335 Valley Blvd.
Los Angeles 32, Calif.

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

To get efficient fluorescent lighting ... insist on *This Shield on your ballast*

There's more to satisfactory fluorescent lighting than lamps and a reflector. There's always a ballast in the fixture . . . and the way it performs determines whether you'll get *full lamp life, rated light output* and *satisfactory performance.*

Only CERTIFIED BALLASTS carry the shield that assures best lighting. That's because CERTIFIED BALLASTS are made to precise specifications, then tested by Electrical Testing Laboratories, Inc., which certifies they conform to these high standards.

There's no excuse for inefficient, unsatisfactory fluorescent lighting when CERTIFIED BALLASTS are available.

Be sure every fixture you get has CERTIFIED BALLASTS . . . the ones with the shield.

● Complete information on the types of CERTIFIED BALLASTS available from each participating manufacturer may be obtained from Electrical Testing Laboratories, Inc., East End Ave. at 79th St., New York, N. Y.

Participation in the CERTIFIED BALLAST program is open to any manufacturer who complies with the requirements of CERTIFIED BALLAST MANUFACTURERS.

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

by all LIGHTING Standards . . . When compared with the most approved standards in the science of illumination, "Magna-Flo" systems excel: in *high lighting efficiency*, because these units are specifically designed for maximum utilization of the highly efficient T12 Slimline Lamp; in *high light output*, providing high footcandle readings on vertical surfaces and horizontal levels; in *proper brightness balance*, to provide maximum visual comfort and seeing efficiency; in *elimination of direct glare*, to reduce eye fatigue and interference with vision.

BENJAMIN "Magna-Flo" Excels!

Compare Benjamin "Magna-Flo" Industrial Lighting Systems with *all* established quality standards. You'll easily see why "Magna-Flo" units excel *all* ways! The "Magna-Flo" line is SO COMPLETE that over 300 combinations are possible from just 4 basic reflectors and 3 channels. This completeness makes possible TASK-MATCHED installations for the proper lighting of practically all types of industrial seeing tasks. In addition, "Magna-Flo" excels:

by all ELECTRICAL Standards . . . In "Magna-Flo" units you get equipment that meets the maximum established electrical standards to assure simplified installation, high efficiency and dependable operation. Top-of-channel knockouts provide handy line-wire entrances. Channel caps are easily fastened to the channel by two screws. For maximum efficiency and continuously-cool operation only high-power factor "ETL"-approved ballasts are standard equipment on "Magna-Flo" lighting units.

by all CONSTRUCTIONAL Standards . . . You'll find "Magna-Flo" excels in all ways to assure longer life and quicker, simplified maintenance. Reflecting surfaces are genuine "Life-Time" Porcelain Enamel, which does not discolor, scratch or become dull. Year after year, original light-reflecting efficiency can be sustained by simple soap-and-water cleaning. Further, "Magna-Flo" *excels because* ONLY "Magna-Flo" has "Springlox". This all-metal lampholder speeds up re-lamping, improves lighting equipment maintenance.

Write for Bulletin AD-5705, Benjamin Electric Mfg. Co., Dept. J. Des Plaines, Ill.

SOAPSTONE *SUPERIOR* CONDUIT

Trench-side delivery lowers underground construction costs

SOAPSTONE *superior* conduit is delivered direct to the job at no extra cost in most California locations. There is seldom any need for the contractor to use his own trucks and crews for re-handling. Storage is not a problem. Conduit and fittings in standard sizes available from our large factory stocks at the time and place you desire. Through the years electrical construction men in the West have found that for underground encased duct systems SOAPSTONE quality and SOAPSTONE service have combined to give lowest installed costs.

SOAPSTONE conduit has been the standard for underground power and communication circuits for 25 years. Its exceptionally smooth bore permits fast, frictionless cable-pulling with no abrasive danger to the sheath. It dissipates heat rapidly, keeping power cables cool for efficient operation. Convenient length and simple collar-type coupling make it the only truly "one-man" conduit available.

SOAPSTONE *superior* conduit is made in sizes from 2" to 5". Spacers, bell-ends, bends and adapter fittings to meet all situations. Distributed throughout the West by

MAYDWELL & HARTZELL, INC.

San Francisco — Los Angeles — Phoenix
Portland — Seattle — Spokane

SOAPSTONE DUCT COMPANY

110 Linfield Drive, Menlo Park, Calif. Factory: Oakland, Calif.

PERMANENT CIRCUIT PROTECTION

ELECTRICAL BOOKS

ALTERNATING-CURRENT MACHINES, by George V. Mueller, 502 pages, 6x9, McGraw-Hill Book Co. Inc., $7.50. This text presents an analysis of construction and operating principles of transformers, polyphase induction machines, synchronous machines, single-phase motors and rectifiers. It is intended for use by senior electrical engineering students. Problems and oscillograms are included to illustrate principles discussed, and recent applications of high-frequency induction motors and rectifiers are included.

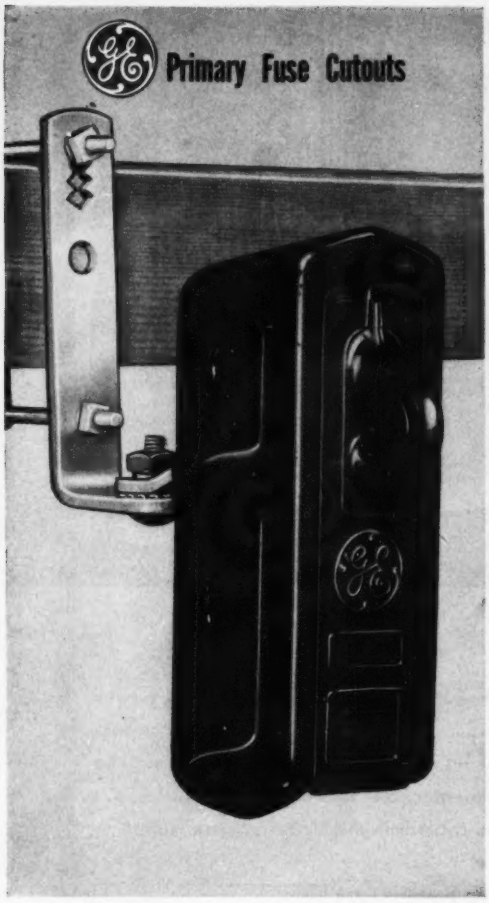
HOW TO PASS RADIO LICENSE EXAMINATIONS, by Charles E. Drew, third edition, 367 pages, 6x9, John Wiley & Sons Inc., $4.50. This book is designed to assist the reader in determining whether he has sufficient knowledge of the radio communication field to pass an FCC examination for radio operator license or permit, except aircraft radiotelegraph and ship radar techniques license endorsements. It is not intended as a textbook but as a review and reference book for use before taking license examinations.

ENERGY SOURCES—The Wealth of the World, by Eugene Ayres and Charles A. Scarlott, 344 pages, 6x9, McGraw-Hill Book Co. Inc., $5. An analysis of existing fuel supplies and what we can do against the day they are exhausted; a census of our energy sources, past, present and future. The book covers the history of man's efforts to wrest energy from nature, a review of the resources, technology of production, efficiency of conversion, and progress being made in conservation.

D-C POWER SYSTEMS FOR AIRCRAFT, by R. H. Kaufmann and H. J. Finison, 206 pages, 6x9, John Wiley & Sons Inc., $5. It is based on theoretical analysis and flight, and laboratory tests made by the authors and their associates at General Electric and the Air Force Laboratories at Wright Field. A minimum of mathematics is used in developing operating theory. The final relationships are expressed in simple mathematics and in the form of curves and charts.

ELECTRICAL ENGINEERING, by Clarence V. Christie, sixth edition, 675 pages, 6x9, McGraw-Hill Book Co. Inc., $7. This revision of the book maintains the elementary approach but is directed toward preparing the student to extend studies into more advanced phases of the subject. It is written primarily for students in the low-frequency power, industrial and electrical fields; also is a basis for those interested in electronic control and communication engineering.

FUNDAMENTALS OF AUTOMATIC CONTROL, by G. H. Farrington, 285 pages, 6x9, John Wiley & Sons Inc., $5. A general survey of the field of automatic controls and the problems that may be encountered, dealing with the underlying principles rather than specific details. Mathematical methods are employed in the analysis.



This cutout is liberally designed—has high dielectric strength, uses silver-plated contacts, provides full-range interruption of fault currents, and is conservatively rated as to interrupting capacity. All live parts are completely enclosed for maximum safety.

4 CUTOUTS IN ONE

by simply changing doors

AND THAT'S ONLY HALF THE STORY! By stocking only three interchangeable doors which fit both 5.2 and 7.8 kv, 50-ampere housings, you get the 4 operating functions illustrated below—a total of eight essential cutout combinations! Available also in 100-ampere ratings, this unique flexibility reduces inventory and simplifies stocks.

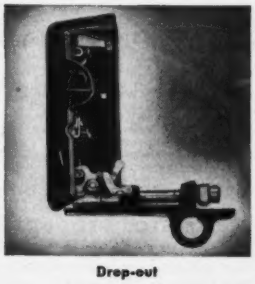
INDICATING OR DROPOUT WITH A TWIST OF THE WRIST! A small wire yoke, easily inserted or removed, determines whether the fuseholder door "kicks out" at the bottom for visual indication, or drops open—either way giving positive evidence of a blown fuse.

RECLOSING DOOR AVOIDS UNNECESSARY SERVICE TRIP! The two-element reclosing door restores service within one second after a temporary fault blows the first fuse link. By avoiding an extra service trip, the two-shot cutout pays for itself the first time it operates!

FLEXIBLE DISCONNECT BLADE CAN'T GET LOST! It's fastened to the door—can't be misplaced. This disconnect blade doubles the continuous current rating of the cutout. When the blade is disconnected and the door closed, the flexible cable extends downward to indicate that the circuit is open.

Only G.E. offers you this flexibility of cutout applications. For complete information contact your G-E sales representative, or write for Bulletin GEA-3448. *General Electric Co., Schenectady 5, New York.*

Indicating


Drop-out

Reclosing

Disconnect

GENERAL ELECTRIC

406-39

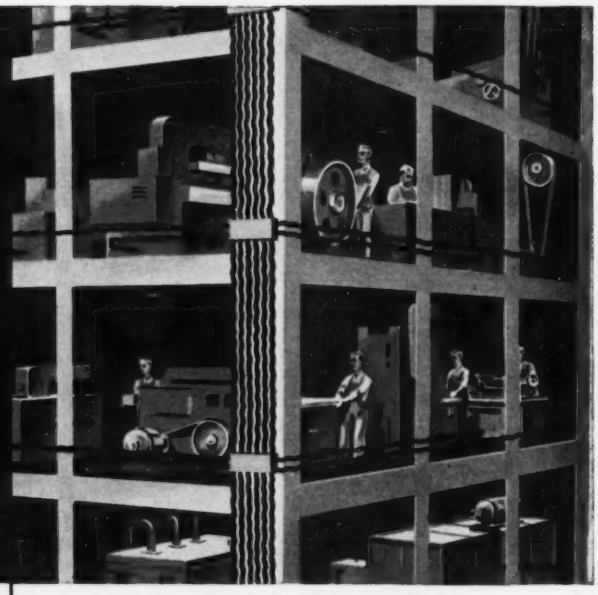
With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

NEED NEW LIFE IN YOUR UNDER-POWERED BUILDING?

GET UP TO 50% ADDITIONAL POWER

WITHOUT REPLACING PRESENT CONDUIT WITH

ROCKBESTOS A.V.C.®



Here's How You Benefit

Use Same Size Cable . . . get ⅓ to ½ more current.

Use Present Conduit and Fittings . . . save on steel.

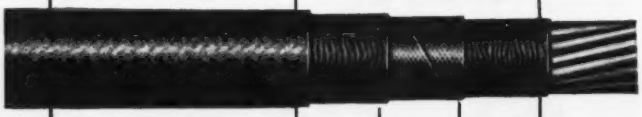
Installation Costs Are Low . . . cable size remains the same, is easy to pull through conduit. Using present conduit eliminates costly installation.

No Building Repairs . . . because you use existing conduit, there are no walls to repair, no weakened beams or partitions to repair.

A Time Saver . . . Old buildings or new, Rockbestos A.V.C. is a dollar-saver, and time-saver. Write for booklet "Rx for a Building with Hardening of the Electrical Arteries."

Have electrical loads outgrown your power requirements? You can increase your capacity up to 50% by merely replacing the present cable with Rockbestos A.V.C. . . . *the cable with the higher ampere rating.*

IT'S THE **A.V.C.** "SANDWICH" THAT MAKES THE DIFFERENCE



This "sandwich" protects the varnish cambric. It enables A.V.C. to carry more current than cables with conventional insulations.

Inner Felted Asbestos Wall	Varnished Cambric	Outer Felted Asbestos Wall

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN. • the originators of **A. V. C.®**
New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
New Orleans • Los Angeles • Seattle • Oakland, California

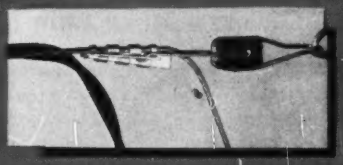
Hi ...*Your best buy*

Here are
THREE NEW KEARNEY PRODUCTS
for Dead-Ending Self-Supporting Bare Neutral Service Cable...

INEXPENSIVELY • EASILY

PERMANENTLY

A typical installation using a Kearney Strain Insulator Assembly, Cat. No. 17590



1 The Kearney Wedge-Tite Clamp is built with a serrated wedge that grips the bare wire with a force proportional to the strain put upon it. This strain is not transmitted to the insulated conductors thus eliminating insulation creep and the danger of leakage and shorts.

2 The Cable Tie is installed in front of the Wedge-Tite Clamp, securing the insulated wires to the bare neutral thus preventing separation of the conductors.

3 The Drop Wire Hook is an inexpensive, easily installed (lag screw) method of anchoring the Wedge-Tite Clamp at the service entrance.

For additional information on Kearney Pole Line Accessories turn the page...

K-190

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant—Guelph, Ontario

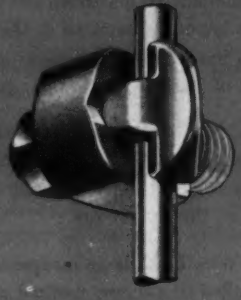
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

Increase Efficiency Reduce Maintenance

with **KEARNEY** pole line equipment

NEW KEARNEY RUST CUTTER

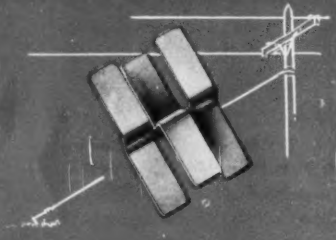
To eliminate time wasted in loosening ferrous nuts, bolts and other hardware because of corrosion, simply spray Rust Cutter from its self-contained, pressurized can. Chemical is automatically atomized. Fine mist reaches every rust particle on threads, etc. Action is complete in a few seconds. A film of long lasting graphite remains thus helping prevent future galling.



TRANSFORMER GROUNDING LUG

Fits All Transformers Equipped with Threaded Grounding Pad

To provide a low-resistance ground connection, Kearney recommends this bronze transformer grounding lug. Ground wires are securely fastened quickly, easily. Accommodates ground wires from No. 6 solid through No. 1 stranded copper.



Serve Guy Wire Strand Ends Permanently with the KEARNEY FINGER GRIP GUY CLIP

To use this clip no special tools are required and it is impossible to position incorrectly. These clips are easily inserted between the strands, and tabs are bent around the wires. Clip is made of aluminum and will outlast the strand itself. Faster and neater than using waste strand.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Mo. • Canadian Plant—Guelph, Ontario

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

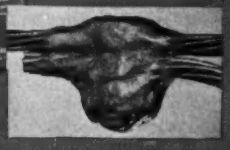
Designed to help your linemen do a BETTER job FASTER

Seal Out Oxidation and Corrosion on Any Connection with KEARNEY AIRSEAL

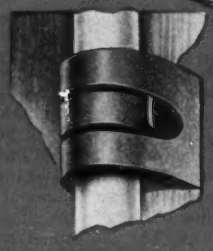
Kearney Airseal is a pliable high-dielectric compound which is chemically inert. It is the most nearly perfect material on the market today for sealing out moisture, oxidation and corrosion.

Airseal is applied by kneading it over the terminal or connector to be protected, forming a protective coating impervious to moisture and contaminated atmospheres. For any connection protection problem—investigate Kearney Airseal.

AIRSEAL



Eliminate Radio Interference— Use KEARNEY *NON-STATIC* GROUND WIRE CLIP



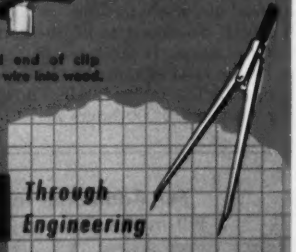
Ordinary staples are entirely inefficient in securing ground wires because the contact pressure is dependent upon their hold in the wood and loosening causes air gaps to develop between staple and ground wire. These air gaps cause radio interference.

Illustration at right quickly shows you how the Kearney NON-STATIC Clip completely eliminates the air gap and resultant interference because the pressure between the clip and wire is entirely independent of the clip's grip in the wood.

1 Drive clip until point seats firmly in wood. Insert ground wire under hook.

2 Drive until hook grips wire and starts to protrude through slot in body.

3 Bend end of clip over wire into wood.

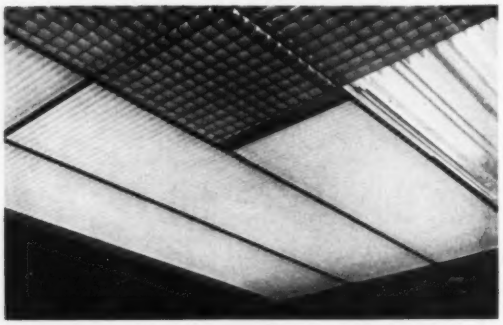


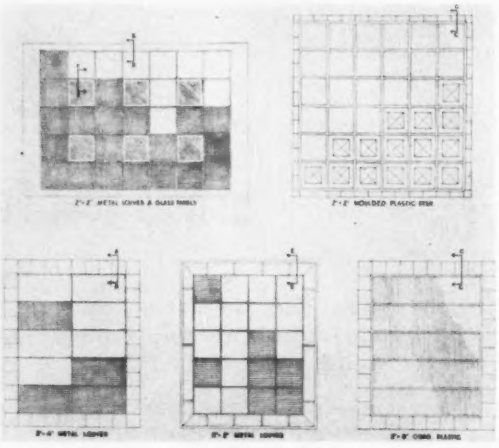
KEARNEY Gives a Little More for a Little Less

Through Engineering

West Coast Distributors: MAYDWELL and HARTELL, Inc.

PRODUCT NEWS





New system being installed, above, typical room layouts, right

Area Illumination

(1) Smithcraft Lighting Division, Chelsea 50, Mass.

An over-all fluorescent system that can be ordered as standard lighting is designed to give choice in size, shape, shielding, intensity and periphery. The manufacturer claims that it can be combined with any acoustical treatment and states that it is ordered and erected as a single unit.

Designed for Slimline lamps, the luminaire is made up of a hanger that can be used also as an insert in new construction and has a longitudinal adjustment allowing for 2 in. in either direction; hanger rod assemblies, housing or a group of housings; spacer tubes whose function is to hold the housings in exact relation to each other.

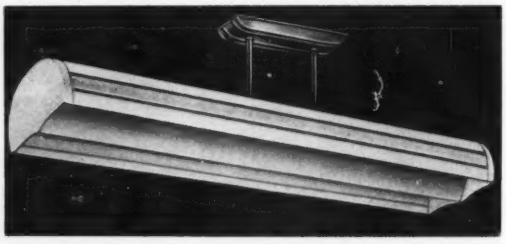
The system may or may not have reflectors depending on depth and finish of the cavity above the lamps. The sides of the fixtures, which may become intermediate parts in the system, are called runners and are hung on runner hangers. Main runners parallel sides of fixtures and connecting runners parallel end plates. For a finish, there is a combination molding, border molding for flange and border molding for snap-in.

1,000-w Mercury Lamp

(2) General Electric Lamp Department, Nela Park, Cleveland 12, Ohio

A newly developed 1,000-w mercury lamp for general industrial use where medium- or high-bay lighting is desired has been developed to fill the gap between the 400- and 3,000-w lamps. It produces 52,000 lumens and is claimed to be the most efficient of G-E's general lighting mercury lamps. Its life rating is 3,000 hours at five burning hours per start and 4,000 hours at 10 burning hours per start. It operates satisfactorily in any burning position. Designated A15, it is 14¼ in. over-all; its heat-resistant outer bulb is 3½ in. in diameter.

For Additional Information
Fill in the Coupon on Page 72



Commercial Lighting

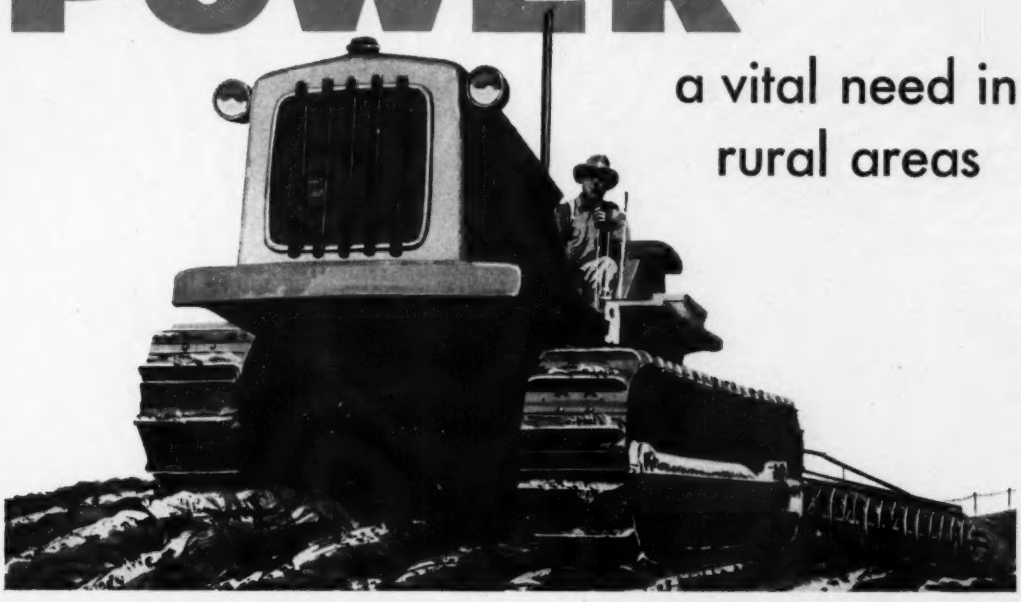
(3) Mitchell Mfg. Co., 2525 Clybourne Ave., Chicago, Ill.

The Sovereign line of ten commercial lighting units is available in 48-, 60- and 96-in. lengths and five lamp types, T-12 medium bipin, T-12 single pin, instant start, T-17 low brightness, T-17 Krypton and T-12 Slimline. All units have a one-piece, die-formed 20-gage sheet steel body channel, finished in heat-resistant hard white baked enamel. An elliptically shaped reflector of special design gives smooth light distribution over the entire illuminated area, the manufacturer states. The illustration is model 3245, which uses two T-17 40-w low-brightness lamps.

(4) GERMICIDAL UNIT—A new explosion-proof germicidal unit for use in hazardous areas is designed for wall or ceiling mounting to furnish direct or indirect irradiation. Ultra-violet energy is furnished by two hairpin-shaped Safe-T-Aire lamps. Made by Hanovia Chemical & Mfg. Co., Germicidal Equipment Division, 100 Chestnut St., Newark 5, N. J.

POWER

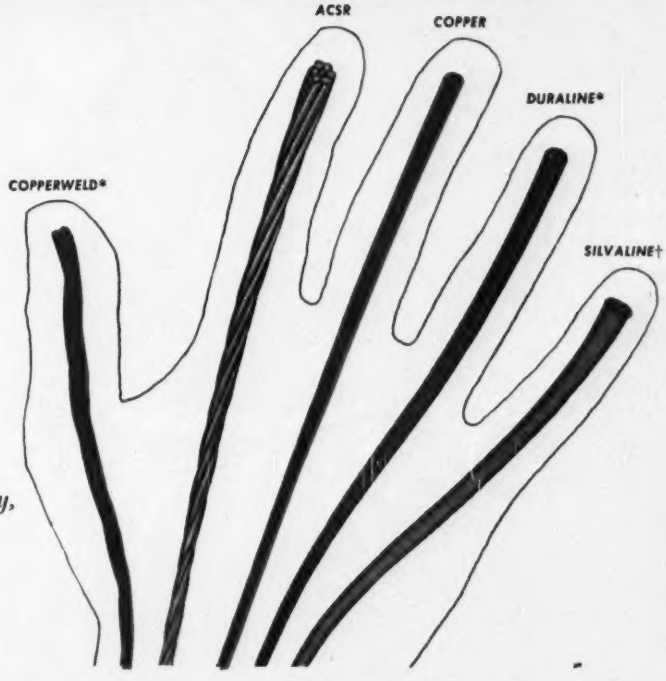
a vital need in rural areas



Anaconda understands this need. It recognizes the problems of rural power distribution. Anaconda knows that foresight and hard work on the part of the distributors of electric power have been largely responsible for overcoming these problems.

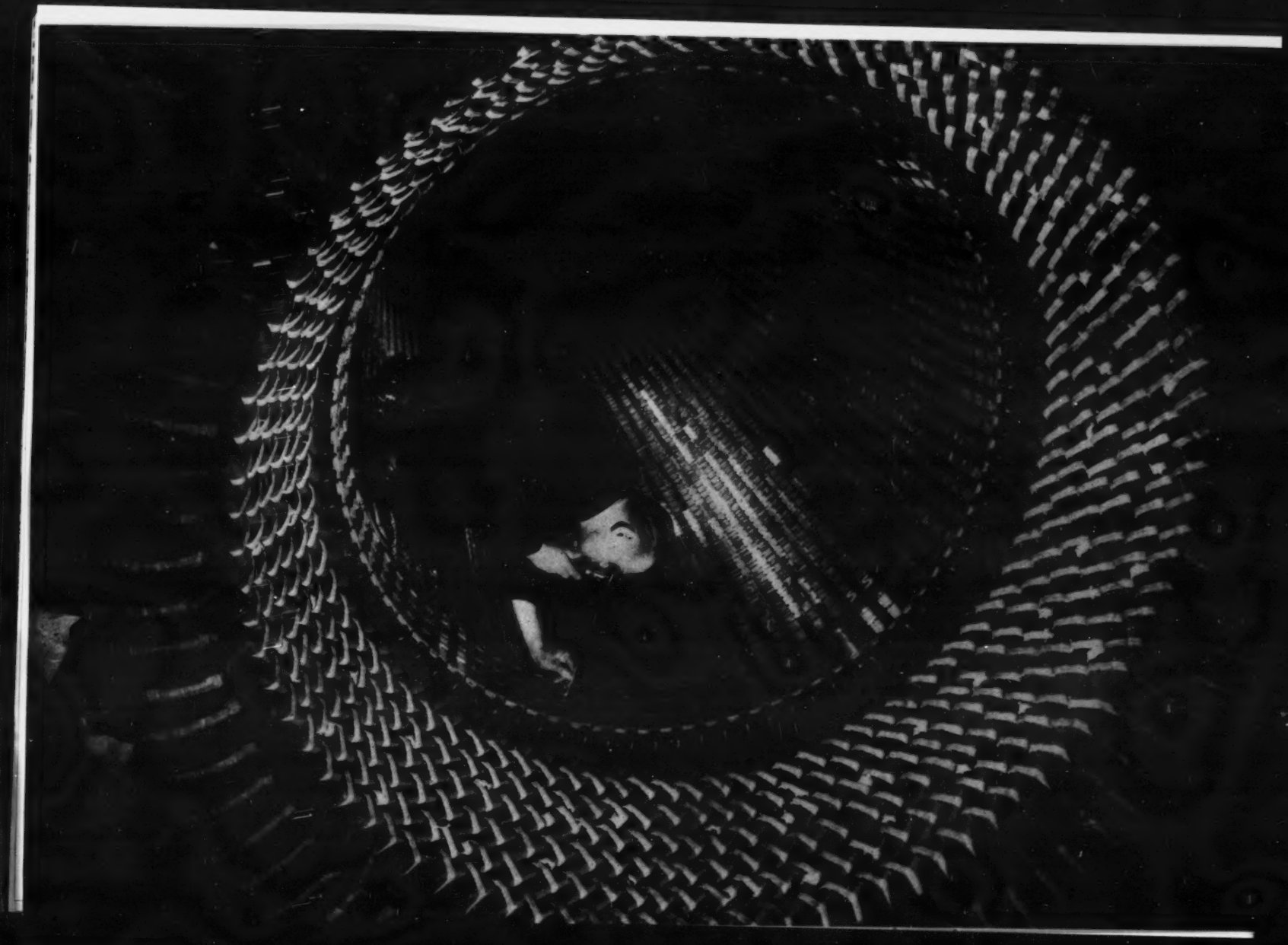
Rural power flows through ANACONDA *Conductors of copper, aluminum and Copperweld.*

Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.



*Reg. U.S. Pat. Off. †Trademark

the right cable for the job ANACONDA® wire and cable



Meeting the Nation's Growing Power Load

Lower Capital Costs through Higher kw Ratings

Your continuing search for better electrical service at reduced cost is the mainspring for our research and development activity. Take generation for example. As long ago as 1929, Westinghouse began pioneering on the large 3,600-rpm turbine-generator. This long-range program was based on our belief that higher-rated, high-speed machines would some day be needed.

Today, this long-range thinking stands justified. Many utilities have reached the stage where they must use units of 100,000-kw ratings and larger.

The Westinghouse 3,600-rpm turbine-generator with ratings up to 250,000 kw takes on added economic significance in view of today's rising costs. With higher-rated units of this kind, the over-all cost per kilowatthour can be reduced. The savings are reflected not only in apparatus cost, but in building and foundation costs as well.

Whether it's generating, transforming, regulating, protecting, measuring . . . any or all of the complex scope of utility service, Westinghouse is constantly thinking ahead about all your problems. How high ratings will go in the future is unknown . . . what we do know is that America's power appetite is growing. With this realization goes our responsibility to build more efficient apparatus . . . that is economical and reliable. J-97161

YOU CAN BE SURE...IF IT'S

Westinghouse

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver

200,000-kw ratings are here

Philadelphia Electric Company has ordered from Westinghouse the largest single-shaft, high-speed turbine-generator unit ever undertaken; delivery is scheduled for 1954. This 3,600-rpm, triple-exhaust turbine is rated at 200,000 kw. The generator, using Westinghouse-pioneered, inner-cooled conductors, is rated at 235,294 kva. The generator will operate at 30-pound hydrogen pressure normal rating and will be good for 10% increased capability with 45-pound hydrogen pressure. Other higher-rated turbines are on order.

25-inch blades

The new 3,600-rpm turbine design was made possible largely by the use of Westinghouse-pioneered 25-inch blades. This is one of the most important of all Westinghouse contributions to higher-rated machines and higher steam temperatures and pressures; because the factor that determines the economic rating of any turbine is the size of the exhaust annulus, or the length of the last-stage turbine blade. The advance from blade lengths of 20 inches in 1935 to 25 inches today, represents one of the great triumphs of Westinghouse engineering.

Inner-cooled rotors

For large 3,600-rpm generators, Westinghouse has developed hollow rotor coils cooled by direct contact with hydrogen. Such coils will make it possible to increase ratings by as much as one half. Units larger than 200,000 kw are possible, while still maintaining industry-accepted short-circuit ratios and sufficiently high rotating mass for system stability.

Related generator developments kept pace

Generator developments matched turbine progress to make the new, large, 3,600-rpm, turbine-generator possible. For instance, there's the slotted rotor design, which eliminates double-frequency vibration; and flexibly-mounted stator assemblies to isolate the 120-cycle frequency vibration from the generator foundation. Another important advance is the development of Thermalastic® insulation for armature windings.

To learn what these developments mean to you, call your Westinghouse Electric Utility representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

Clamp Assembly

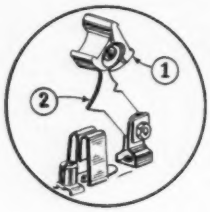
(5) Ohio Brass Co., 380 N. Main St., Mansfield, Ohio

This large-size clamp assembly will accommodate all aluminum ACSR conductors or conductors and armor rod up to 1½ in. in diameter and is offered for interchangeable use on the manufacturer's Clamptop pintype and post insulators and ground wire brackets. It has a high-strength aluminum alloy body and, according to the manufacturer, will operate at currents up to 1,000 amp, 60 cycles with virtually no heating.

Special bolt heads hold the clamp securely to the mounting pintles and are designed to resist uplift. It is said to be easy to slip the clamp off the insulator head either by hot-line or hand tools. Pivot supports allow the clamp to rock freely through a 15° arc and the seat is so designed that the conductor can be deflected as much as 30° vertically or horizontally.

Safety Grip Handle

(6) States Co., 3 New Park Ave., Hartford, Conn.



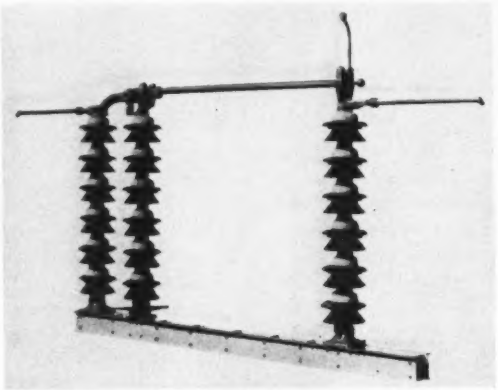
A new grip handle for the manufacturer's type SJK test blocks is claimed to give safer, easier gripping. It comes in 12 colors to conform with color cable coding. The handle grip is mounted on the manufacturer's angle blade. As this angle-shaped blade enters the jaw, it opens up the full width of the jaw evenly. The switch hinge design permits easy removal of the blade, if knob of different color is desired after the block has been installed. The illustration shows (1) new safety grip handle; (2) angle-blade design of test blocks.

Lightning Arrester

(7) Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa.

This new item in the manufacturer's line of Autogap lightning arresters is of horizontal design and embodies the features of the rest of the line, including the twin exhaust to give maximum surge capacity. The new Autogap, No. 2327, has a maximum voltage rating of 18,000 v, twice that of any previous item in the line. It may be installed on arm or pole with standard Hubbard mounting brackets. Details in bulletin 1951, available from the manufacturer.

(8) A new method of packaging magnet wire, developed under sponsorship of Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y., is made of two identical parts of molded fiber. This container is claimed to get the wire from factory to user in perfect condition and to be easy for shipping and receiving men to heft. Weight is one-third that of the old-style box type and is said to pack better. Sharp corners, nails, slivers have been eliminated



Air Break Switch

(9) Southern States Equipment Corp., Hampton, Ga.

Type WAG air break switch is being manufactured in 196- and 230-kv ratings, available with or without grading rings. This is a high-pressure vertical-break 3-insulator switch with center insulator rotating. It is designed for sectionalizing, main-line disconnecting and by-passing service and is for use in substations, on transmission lines and distribution feeders. It comes for horizontal upright, vertical or inverted mounting positions and can be supplied for either right- or left-hand operation; is available in all standard NEMA ratings from 7.5 through 230 kv and in current ratings from 400 to 4,000 amp. The 230-kv 1,200-amp model with outriggers installed is shown above.

For Bulletins, Mail Coupon on Page 72

Sangamo J Meters

have damping magnets that are *permanent*

Sangamo Type J Watthour Meters are equipped with surge-proof alnico damping magnets to completely eliminate change in calibration.

Because the damping magnets control the speed of the meter, accuracy depends on the permanence of their strength. Alnico has many times the resistance to the demagnetizing effects of lightning surges as the best forged steel magnet materials.

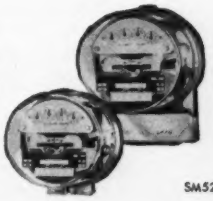
The aluminum mounting clamp provides additional protection since it acts as an effective shield, further insuring the permanence of the damping force.

No report has ever been received of a J Meter speeding up in service due to loss in damping strength . . . and more than five million Sangamo Type J Watthour Meters are in service . . . many for more than ten years!

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.



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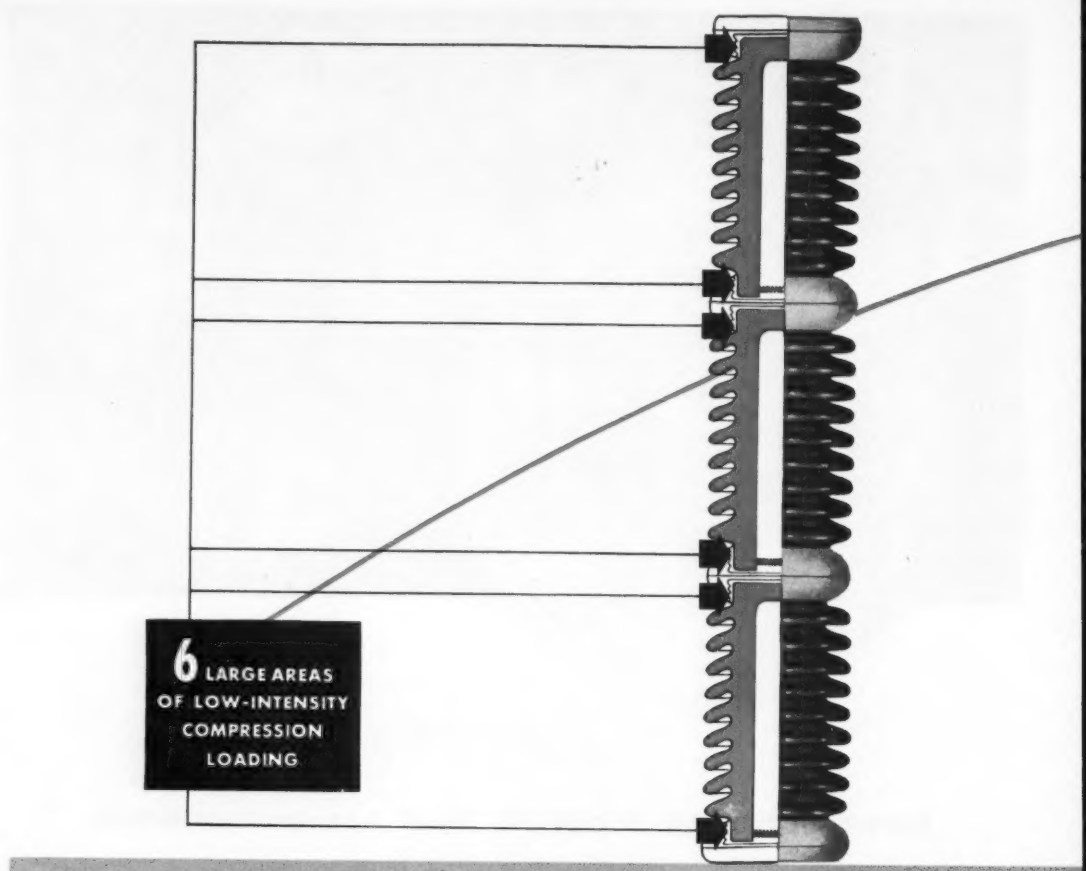
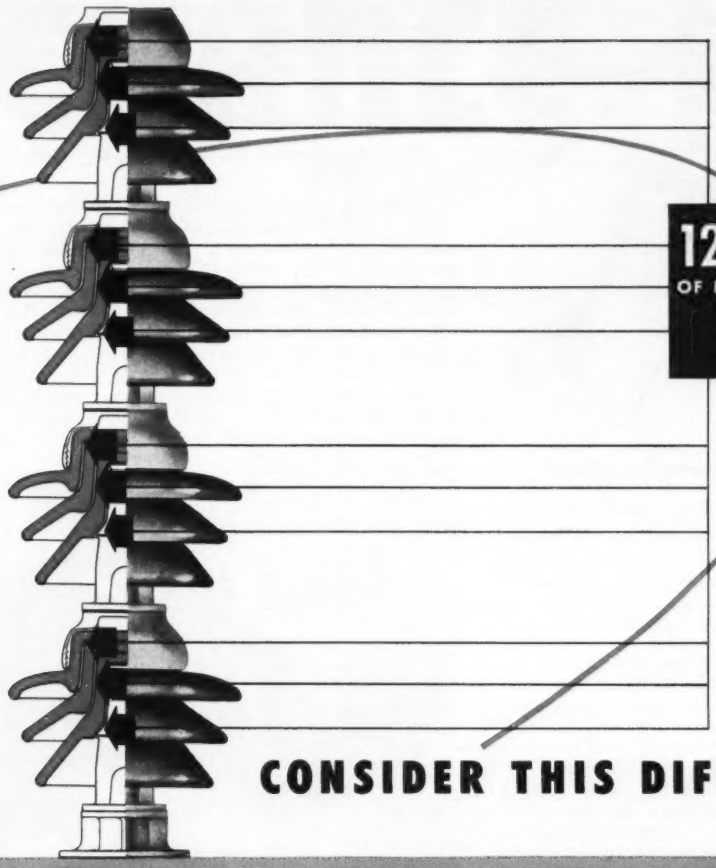


Lapp

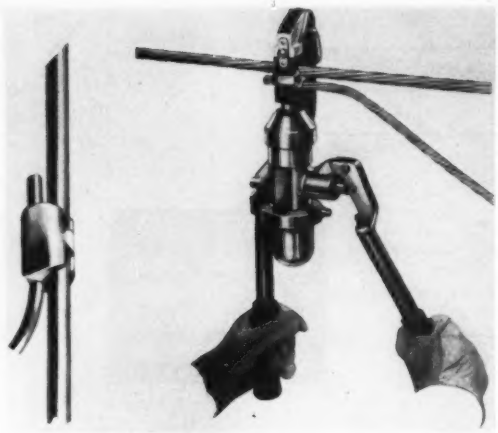
LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK



CONSIDER THIS DIFFERENCE...

. . . BEFORE YOU ACCEPT ANY SPECIFICATION FOR ANY SWITCH OR BUS SUPPORT INSULATOR

There are important differences between the Lapp Station Post and a conventional multi-part pin-and-cap station insulator—a difference in appearance—a bigger difference in how they work. For switch and bus support, mechanical security is fully as important as electrical characteristics. Rigidity and permanence under stresses from thermal change, tension, cantilever and impact, depend on security of mechanical loading within the insulator. In the Station Post design, Lapp recognizes that porcelain is approximately 10 times as strong in compression as in tension. This advantage is utilized in building the Station Post with hardware externally attached. In the corresponding units sketched above—a Lapp Station Post and a NEMA Standard pin-cap assembly—for duty at 138-161 kv, *compare* the *six* cemented joints of the Lapp Station Post, which can load porcelain only in compression, with the *twelve* nested shells of the pin-cap unit, each an area of loading which depends on tension strength of the porcelain. Isn't the Station Post superiority evident as a simple engineering conception? It's just as evident in operating security . . . in length of life . . . in elimination of outages . . . in cost of maintenance.



Connector Claimed to Eliminate Oxidation

(10) James R. Kearney Corp., St. Louis, Mo.

The Squeezon is a pure copper compression-type connector forged in a shape having an H cross section. The connection is made by placing one conductor in the top half of the H and the other in the bottom. The sides are then coined over under tremendous hydraulic pressure to make a complete, permanent electrical bond.

According to the manufacturer, the connector was developed to eliminate contact surface oxidation and maintain low resistance. It is said also to require approximately half the amount of metal needed for a conventional-type connector.

The Squeezon limits corrosion development by excluding air from around contacting surfaces and by keeping temperature below the oxidizing point of metal. It is clamped in place with a hydraulic tool that applies extra-high pressure to the connection. Force between the wires is claimed to be in order of 10 times the pressure exerted by properly tightening other types of connectors and the surfaces are said to be in effect cold welded together. Other advantages claimed are uniform tightness, permanence, easy application, low cost.

Two types are available. One is solid copper and is corrosion inhibited at the factory. The other is plated solid copper made oxidation resistant by a special process. The first handles all copper line to copper tap combinations in sizes 4/0 through 8 solid. The latter accommodates the same range of sizes for all combinations of copper, Copperweld, aluminum, ACSR, Amerductor and Ruralductor. Plating prevents the combination of dissimilar metals from giving rise to galvanic action and provides excellent current transfer surface in the connector, it is pointed out.

The Squeezon tool is 21 in. long and 6¼ in. wide. Dies are furnished in pairs for each connector size.

New Film Produced Experimentally

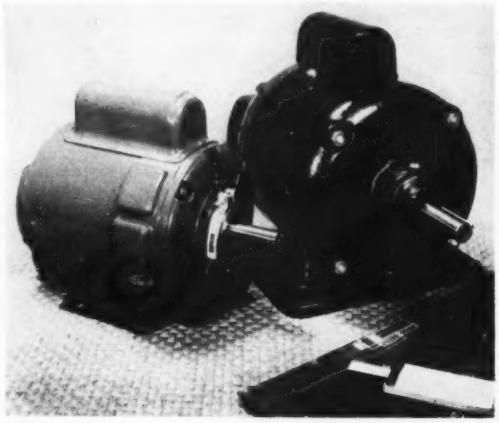
(11) E. I. duPont de Nemours & Co., Wilmington 98, Del.

A new film claimed to have unusual strength, heat resistance and insulating qualities is being evaluated in industrial fields. Trademarked Mylar, it is a polyester film similar in appearance to cellophane but with distinct properties that appear to make it suitable for a number of new industrial uses, according to the manufacturer, who states that the most promising immediate field seems to be electrical insulation. It is expected to be several years before it is generally available commercially.

Laundry Machine Controller

(12) Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

A controller to give automatic reversing of laundry tumbler driving motors is built in a NEMA type 1A semidust-tight enclosure and comes in NEMA size 1, handling up to 5 hp at 208-220 v three phase and 7½ hp at 440 v three phase. The unit consists of a standard reversing Life-Linestarter, a timing relay, braking relay and a 5-point terminal block in a common enclosure. The timing relay is set to give three reversals a minute in a cycle of 17 seconds in each direction, with intervening off periods of two seconds. The braking relay automatically controls the magnetic brake on the tumbler motor to stop it quickly between reversals.



Fractional Horsepower Motors

(13) General Electric Co., Schenectady 5, N. Y.

Fractional horsepower motors said to embody a new concept of design and manufacture weigh as much as 51% less per horsepower than models replaced and are smaller in size. Designated form G, the motors are available in open dripproof and totally enclosed fan-cooled models in types K, polyphase; KC, capacitor start; KH, split phase; KCP, permanent split capacitor. They have applications on pumps, fans, blowers, compressors, office and home appliances, etc., and the principles will be adapted to motors for more specialized uses as the line is expanded, it was announced.

The design incorporates a new insulation system consisting of a nylon material scientifically combined with Formex wire and Glyptal varnish to give motors longer life. Other features are new bearings, lubrication system, ventilation, mountings, windings, end shields, terminal board and leads.

Conforming to all NEMA specifications, the motors will be offered in a complete range of standard horsepowers, speeds, voltages and frequencies. The illustration shows form G, left, compared to form B motor of the same rating.

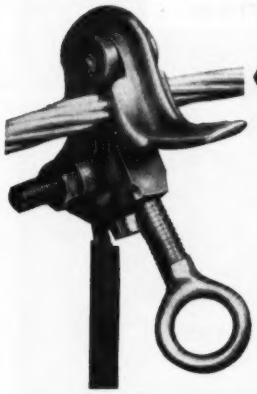
CHANCE

Hot Line Clamps

meet all your tap clamp requirements

Chance Hot Line Clamps are the standard of many companies for all applications. They are moderately priced, yet have quality features that mean better line connections . . . high current capacity . . . high mechanical strength . . . and longer conductor life.

Whatever your requirement—when you specify CHANCE—you can make your selection from *the most complete* line in the industry. Chance Hot Line Clamps are designed on the basis of extensive research and years of connector know-how — they're built by the leaders in the development of hot line clamps.



FLIP-TAP CLAMPS

The Chance Flip-Tap Clamp features a grease chamber, filled with a corrosion resisting compound which prevents the clamp from sticking on the conductor. This clamp is easily guided to the line and is tightened by turning the eye-screw. Jaws of the clamp will take conductors ranging in size from No. 8 solid copper to 4/0 stranded copper or 3/0 ACSR.

PROTECTED CONNECTION CLAMPS

These new Chance hot tap clamps will not "freeze" on the line . . . will not heat excessively . . . will not damage or overstress your conductor . . . and will positively maintain contact throughout the life of the installation. They are available for aluminum or copper connections in sizes to meet every requirement.

PERMA-GRIP CLAMPS

Make permanent or temporary hot tap connections that hold tight without sticking and stay put without vibrating loose. USS threads screw up fast, hold tight . . . yet can be readily unscrewed with a clamp stick. They are available for all types of connections in a complete range of sizes to meet every requirement.

CHANCE ELECTRICAL CONNECTORS

U-BOLT CONNECTORS

These connectors apply to conductors without removing bolts—the swinging center spacer and base eliminate the necessity of removing nuts and lock washers when applying to conductors. No annoyance of losing nuts or washers—application is quicker and easier. Chance U-Bolt Connectors simplify your inventory problems —only *three sizes* are needed. Available for aluminum or copper conductors.

PARALLEL GROOVE CONNECTORS

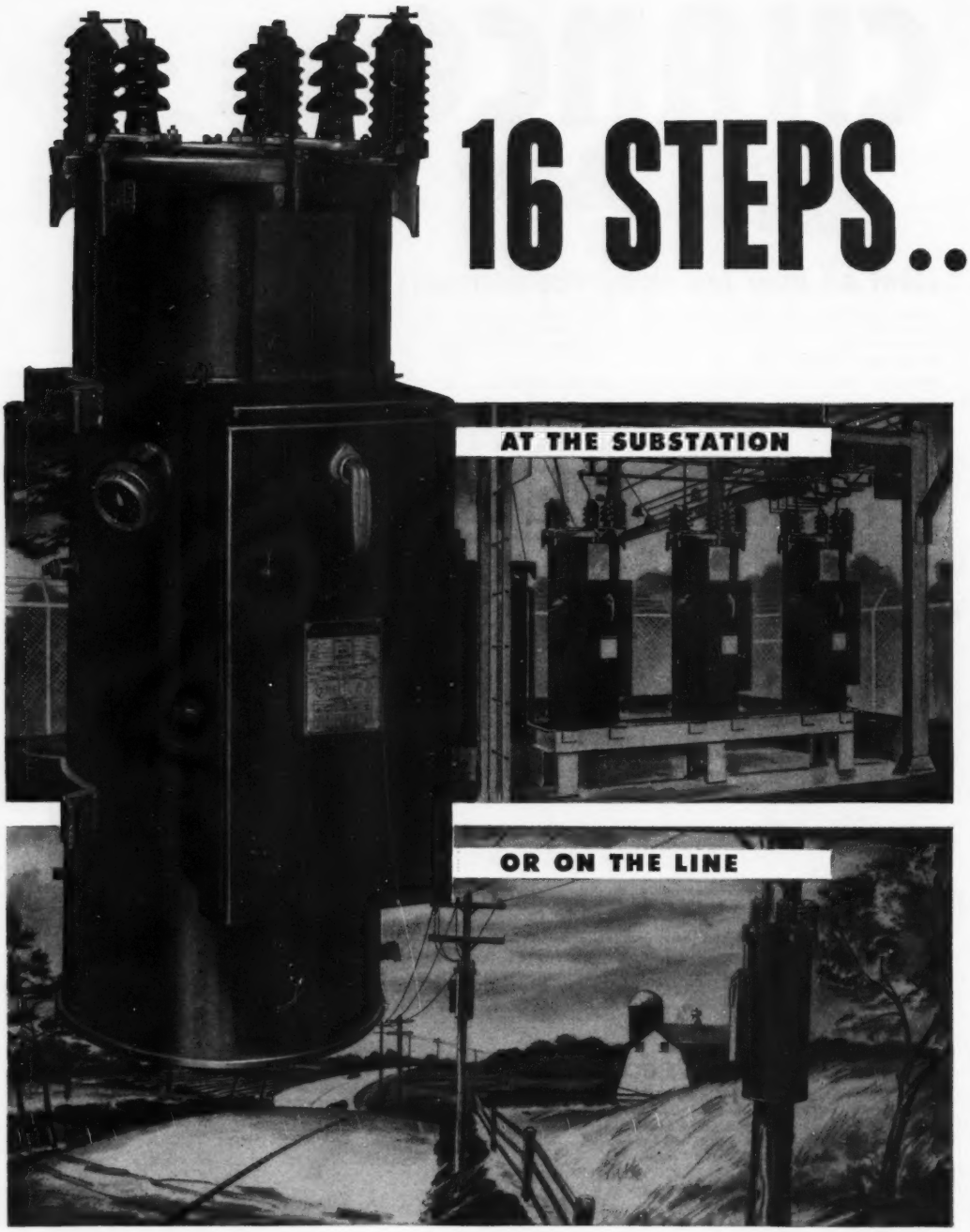
Inexpensive, easily installed, lightweight connectors for use on line construction. All connector bodies plus galvanized bolts, nuts and lock washers are corrosion resistant. Available in a complete range of types and sizes. Heat treated aluminum, galvanized contact copper, or all copper.

For better hot tapping . . . for permanent connections . . . choose CHANCE. The line is complete, and offers the most advanced designs on the market. You know it's RIGHT when you specify CHANCE.

A·B·CHANCE CO.

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

C52-7A


16 STEPS...
AT THE SUBSTATION
OR ON THE LINE

Close Regulation, Reliable Operation ...at the LOWEST COST!

Check these Westinghouse Voltage Regulator advantages. Compare them. The Westinghouse URL-16 with 16, 1¼ steps provides:

- ★ Low maintenance cost . . . made possible with a minimum number of tap-changer operations and a minimum number of contacts and moving parts.
- ★ Voltage regulation within ± 1-volt band width.
- ★ Class 1 control accuracy.

Only the Westinghouse URL-16 has these features:

1. Complete surge protection with "De-ion®" arresters on each line bushing.
2. Direct Geneva Drive Mechanism has controlled contact speed for long contact life, minimum maintenance.
3. Package control in one Flexitest® unit for maximum flexibility and interchangeability.
4. Simplified control has voltage regulating relay with integral inverse time delay.

IMPROVED CONTROL CABINET . . . Control cabinet door is hinged at bottom to provide a "workbench" when in open position. Control cabinet may be mounted integrally with the regulator or on the pole below the regulator.

FOR FURTHER INFORMATION on the new URL-16 Regulator, call your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

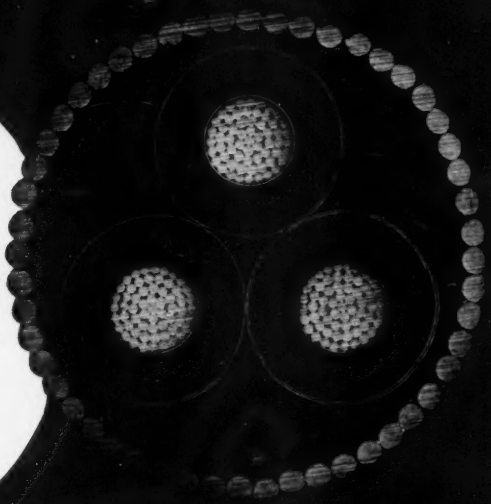
J-70631

Westinghouse URL-16 Voltage Regulator—easy to install, easy to maintain, . . . engineered for every condition of weather . . . every condition of service.

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver

Approved by UNDERWRITERS LABORATORIES
The men who USE them know the difference!
they like this—
BETTER DESIGN
If you have ever spliced wires and cables in real mean locations, you probably are a strong "booster" for Penn-Union Connectors - - -
Because you know how much easier they are to use in close quarters: Working up against a wall...squeezing into small boxes, to join short ends of stiff wire . . . reaching around pipes, and splicing wires in dark holes where you can hardly see.
LARGER SURFACES
for the wrenches make the Penn-Union connector more practical—you grip it from ANY angle, with ANY kind of wrench (box, socket or open-end). Developed by 20 years of constant improvement. Accurately made, with rigid engineering inspection. Reusable over and over. Can be furnished in Bronze or Aluminum.
Far More in use than any other
PENN-UNION ELECTRIC CORPORATION, ERIE, PA.
F. M. Nicholas Co. 140 Spear St. San Francisco
Kenneth Anderson Co. 412 Seaton St. Los Angeles
Northwestern Agencies 4130 First Ave. South Seattle, Washington
The Complete Line of Conductor Fittings
PENN-UNION

OKONITE SUBMARINE CABLE CROSSINGS



57 CIRCUIT MILES INSTALLED BY FIVE UTILITIES PROVE OKONITE CABLES CAN TAKE IT

Date	Footage	Location
1926	20,700 ft.	President Point
1926	20,700 ft.	President Point
1926	15,000 ft.	Lake Union
1930	15,000 ft.	Fox Island
1931	16,000 ft.	Vashon Island
1931	25,000 ft.	Lake Washington
1931	15,000 ft.	Mercer Island
1933	10,000 ft.	Hood's Canal
1935	23,000 ft.	Lake Union
1936	10,000 ft.	McNeill Island
1939	8,500 ft.	Hood's Canal
1939	2,000 ft.	Lake Union
1940	22,000 ft.	President Point
1942	5,000 ft.	Bainbridge Island
1945	22,000 ft.	President Point
1950	16,000 ft.	Vashon Island
1951	39,200 ft.	San Juan Islands (2)
1951	12,000 ft.	San Juan Islands
	297,100 ft.	

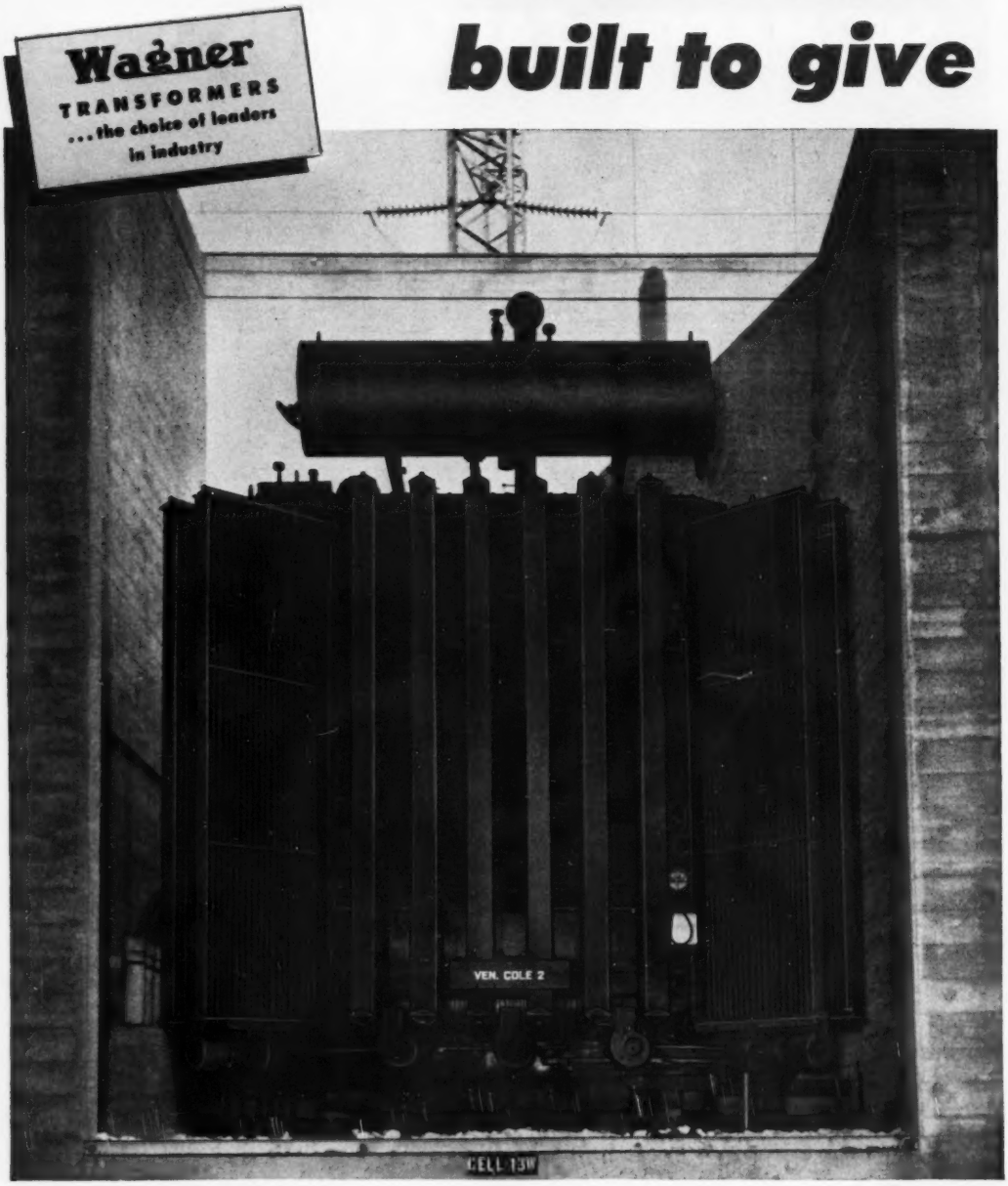
When you specify Okonite rubber-insulated cables —for *any* purpose above or underground—you are sure of dependable year-in year-out performance. For you get electrical insulation designed for the job and a covering engineered to protect that insulation during its full life span under the specified operation conditions. You also get the advantage of Okonite's proved manufacturing techniques, such as insulation applied by the strip process and vulcanization in a metal mold. These are your assurance of long-lived, trouble-free electrical circuits.

Installations in all voltage ranges and under the most exacting conditions are proving every day that Okonite is your most economical cable buy. The Okonite Company, Passaic, N. J.

The best cable is your best policy

OKONITE OKONITE SINCE 1878 ***insulated wires and cables***

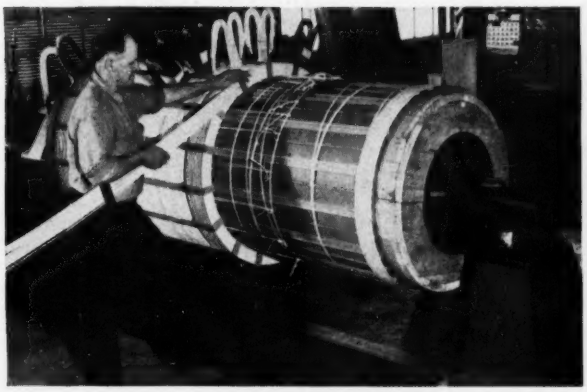
Wagner
built to give

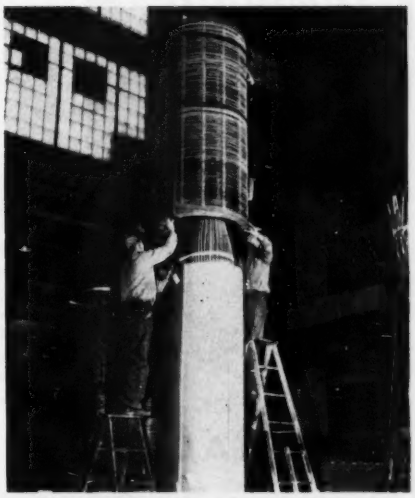


This oil-filled, forced-air cooled Wagner Power Transformer, rated 15000/20000 kva, is one of many installed at the Venice, Illinois plant of the Union Electric Company of Missouri.

T&H

Power Transformers *longer service life...*





Wagner Power Transformers have been serving the power industry dependably for over sixty years. Service records from the field, dating back to the early days prove their ability to give continuous service over unusually long periods of time. They are compact in design and are built with painstaking care to give them inherent strength and stability. They have sufficient capacity to not only carry their normal load, but to be able to handle overloads—again and again—whenever emergencies arise.

Every step in the construction of Wagner Power Transformers is attentively controlled. Three steps are shown here. Highly skilled workers wind a low voltage coil, carefully place a high voltage stack into position, and make the final connections on a core and coil assembly.

Users of power transformers will find it profitable to consult Wagner engineers on their next transformer installation. Thirty-two branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

®Wagner Electric Corporation EST. 1891

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6381 Plymouth Avenue • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

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INSTALL

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LUMINAIRES

for MERCURY-VAPOR or INCANDESCENT LAMPS

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Units available with all necessary Fittings.

REVERE features provide graceful, easy-to-service design, lightness in weight, sturdy construction, excellent illumination.

Full engineering data and installation information available

Write for Full Details

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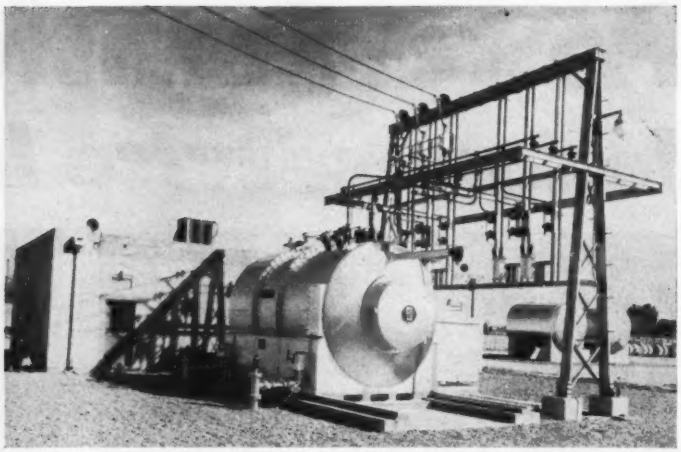
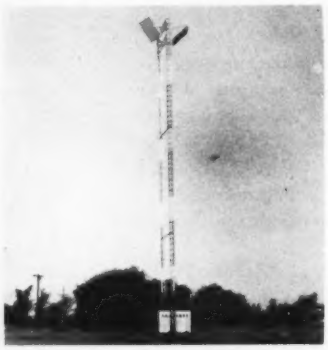


(14) This installation on the USBR distribution system at Tucson, Ariz., is the first of a new line of hydrogen-cooled synchronous condensers made by Elliott Co., Jeannette, Pa. It is rated 20,000 kva at 0.5 psig hydrogen. Each end dome has a liberally designed gas to water heat exchanger which, with large positive-action fans on the rotor, provides balanced cooling and uniformly low gas temperatures. Assembly and disassembly are by crane-booms mounted on end domes and designed for two-ton hoists. Occasional brush replacement is the only regular maintenance required, according to the manufacturer



Industrial 24-Channel Microwave Relay Systems

(15) Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.

A new line of multiplexing equipment for industrial microwave radio relay systems provides facilities for up to 24 voice channels. According to the manufacturer, a cross-country communications system utilizing this equipment can handle either 24 normal voice circuits, more than 400 teletypewriter or telemetering operations, nearly 1,000 remote supervisory control functions or telegraph circuits, or any combination of these facilities.

The new equipment permits users of the manufacturer's microwave 10- or 12-channel systems to expand them to 24 channels. It features double frequency modulation subcarrier-type multiplexing, incorporates the same principles as 10- and 12-channel systems previously supplied and operates in the 6,575-6,875 megacycle frequency band.

Air Conditioner

(16) O. A. Sutton Corp., 1812 W. 2nd St., Wichita 1, Kan.

The Vornado air conditioner for home or office projects 9½ in. into the room; has twin air directors that tilt up or down and rotate through a 360° arc. A forced exhaust feature that operates without the compressor running, permits removal of smoke, stale air or odors when cooling is not required.

The unit will bring fresh air into the room and combine it with recirculated air in any desired ratio, the manufacturer states. The variable cooling operation is accomplished with a single control. Removal of humidity is accomplished at the rate of 7½ gal of water every 24 hours. Finish is grey-green with touches of burgundy and gold.

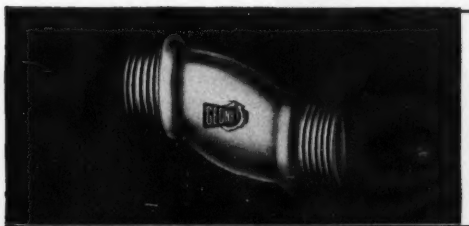
(17) PANEL HEATER—An electric Hot-Rock panel heater that uses no hot-wire elements and may be plugged into any 110-v circuit is offered by Electrofilm Corp., 7116 Laurel Canyon Blvd., North Hollywood, Calif. It can be hung flush against a wall or suspended from the ceiling. It is 2x3 ft, finished in grey with natural wood frame.

FOR OFFSET NIPPLES, NO-THREAD FITTINGS, CONDUIT BODIES . . .

GEDNEY *ALWAYS!*

YOU CAN ALWAYS rely on Gedney Fittings to cut *installed costs* and save real money. For Gedney Fittings are always accurately machined and threaded . . . smooth finished, with no burrs or metal particles . . . quick and easy to install . . . made of unbreakable malleable iron. . . . For best profits, order Gedney Fittings, always!

TYPICAL OF THE FULL GEDNEY LINE ARE:

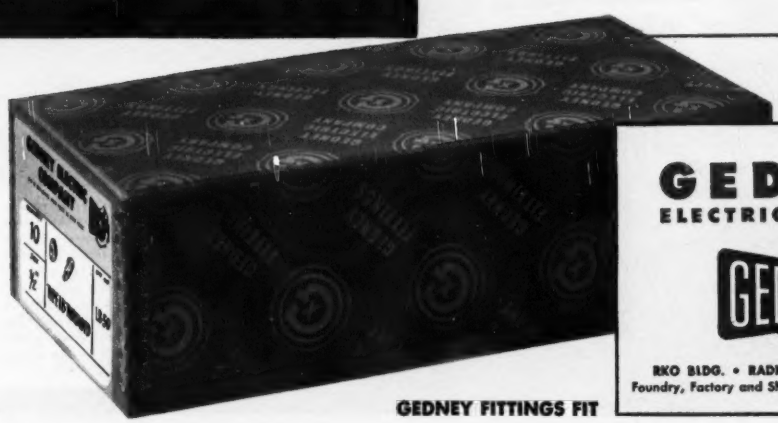


Offset Nipples in sizes from ½" to 2", with ¾" offset. Cadmium plated.

A wide choice of No-Thread 90° Elbows for rigid conduit, and of No-Thread Couplings and Connectors for Sealtite* conduit — all cadmium plated.

*Trade Mark—The American Metal Hose Branch of The American Brass Co.

Conduit Bodies in a full range of types and sizes for heavy wall rigid conduit — hot dip galvanized.



GEDNEY FITTINGS FIT

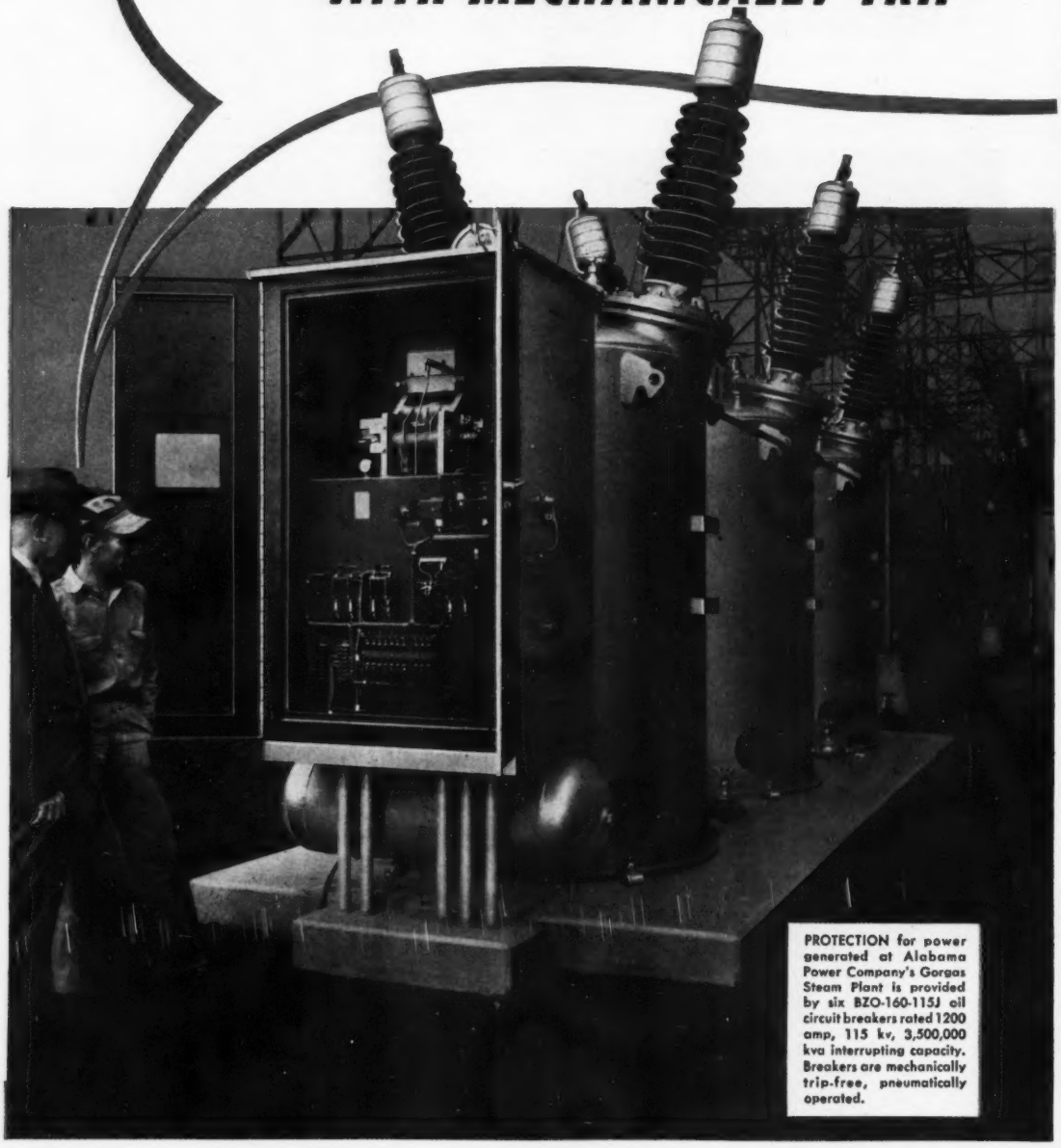
GEDNEY
ELECTRIC COMPANY

GEDNEY

RKO BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

Fast, Positive

WITH MECHANICALLY TRIP-



PROTECTION for power generated at Alabama Power Company's Gorgas Steam Plant is provided by six BZO-160-115J oil circuit breakers rated 1200 amp, 115 kv, 3,500,000 kva interrupting capacity. Breakers are mechanically trip-free, pneumatically operated.

Performance!

FREE PNEUMATIC OPERATION

Power OIL CIRCUIT BREAKERS

ELECTRIC POWER is vital today for defense, for industry and to domestic life. Uninterrupted service contributes to continuous production... helps prevent costly shutdowns. Greater concentrations of electric power make it essential that faults be quickly cleared and service instantly restored.

Helping to maintain power stability of systems across the country are Allis-Chalmers power circuit breakers with mechanically trip-free pneumatic operators. These circuit breakers provide:

Positive, High-Speed Opening — that's the function of the mechanically trip-free mechanism! Tripping always uncouples contacts from the closing mechanism... powerful accelerating spring, aided by gravity, drives contacts open. All possible drag is eliminated.

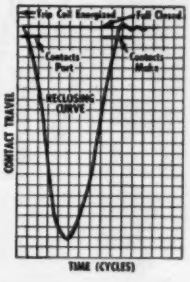
Positive, High-Speed Closing — accomplished with powerful pneumatic operation. Stored energy, enough for at least five closing operations, comes from a self-contained air compressor and tank.

Positive, High-Speed Reclosing — provided by the fast coupling action of the mechanically trip-free mechanism and the fast-acting power of pneumatic operation. Meets the power industry's fastest reclosing requirements.

Over ten years' experience in the field has proven the success of mechanically trip-free pneumatic operation for power oil circuit breakers.

For more information on these power circuit breakers, call your nearby Allis-Chalmers sales office, or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 71B6022C.

A-3607



MECHANICAL TESTS supplement electrical tests. Mechanical performance is verified by special test equipment. The man on the breaker shown above is checking a special speed recorder called a Speedgraph. With this device contact travel vs time is recorded on a synchronized rotating drum. The graph at right is typical for the first or subsequent reclosures.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

MECHANICALLY TRIP-FREE PNEUMATIC OPERATOR IS STANDARD EQUIPMENT ON ALL THESE ALLIS-CHALMERS OUTDOOR POWER OIL CIRCUIT BREAKERS

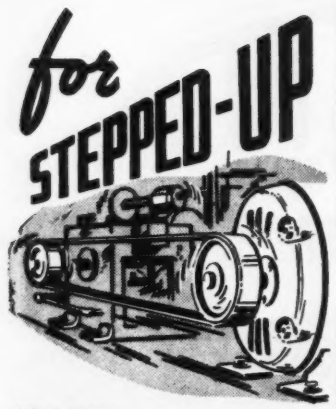
Unitop is an Allis-Chalmers trademark.

Type FZO-150 *Unitop* breaker 14.4 to 46 kv, 8-cycle opening, 20-cycle reclosing*

Type FZO-151 ... 69 kv, 5 or 8-cycle opening, 20-cycle reclosing*

Type BZO-160 ... 69 kv, 8-cycle opening, 115 to 230 kv — 3 or 5-cycle opening with 20-cycle reclosing*

*20-cycle reclosing standard for 600 and 1200 amp breakers



MOTOR
PERFORMANCE

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OHIO
BRUSHES

What makes the performance of motors and generators better? The answer is very simple—merely equip them with the proper OHIO brushes and watch them "Go to work!" In order to pick the proper brush for the proper application, we have compiled complete catalogs on the following various subjects:—Industrial, General Purpose, Mining, Welding, Appliances.

Here at "OHIO" we welcome your inquiries and specifications for unusual and specially designed carbon specialties.

ORDER YOUR CARBON BRUSHES FROM A SINGLE SOURCE

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Los Angeles 13, Cal.

THE OHIO CARBON COMPANY
12508 BEREA ROAD • CLEVELAND 11, OHIO

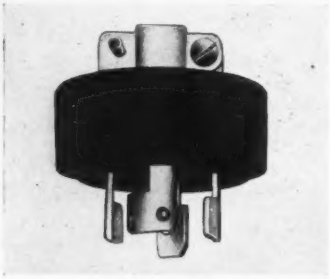
Protector

(18) Reliable Electric Co., 3145 Carroll Ave., Chicago 12, Ill.

Designed for use on communication lines joined with power conductors and at power crossing conflicts, a new-type high-voltage and high-current protector is said to be highly efficient also as a high-current lightning protector for two wires.

The HV protector consists of three heavy-duty cylindrical carbon electrodes mounted on a steatite ceramic base, attached to an aluminum mounting bracket and covered with a weather-tight drawn aluminum cover, which is removable. Three No. 10 insulated copper conductors enter the base through tapered neoprene grommets. The HV is factory wired and comes with a 6-ft ground lead and two 2-ft leads for connecting to the line wires.

Two sizes are in production: the 30HV with an air grip breakover of approximately 3,000 v a-c and the 20HV with a breakover of approximately 2,000 v. Both are for use on one pair of open wires, additional units being required for additional circuits.



Attachment Cap

(19) Rodale Mfg. Co. Inc., Emmaus, Pa.

A 4-wire rubber attachment cap for heavy industrial use has been added to the Turn-Tyte line. The new device is precision made of extremely hard rubber and has a metal cord clamp. It is interlocking, interchangeable with other makes, has all-steel parts coated to resist corrosion, is Underwriters' listed. Cataloged No. 2439, it is rated 20 amp, 250 v and 10 amp, 575 v. Dimensions are: O.D., 2¼ in.; cord hole diameter, .312 to .750.

For More Data
Fill in Coupon on Page 72

Electrical Tape

(20) Minnesota Mining & Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

A new oil-resistant tape, Scotch brand No. 25, is for rapid insulation build-up on splices in large power cables. It is made of synthetic rubber and is said to provide greater dielectric strength and resistance to high temperatures than natural rubber tapes.

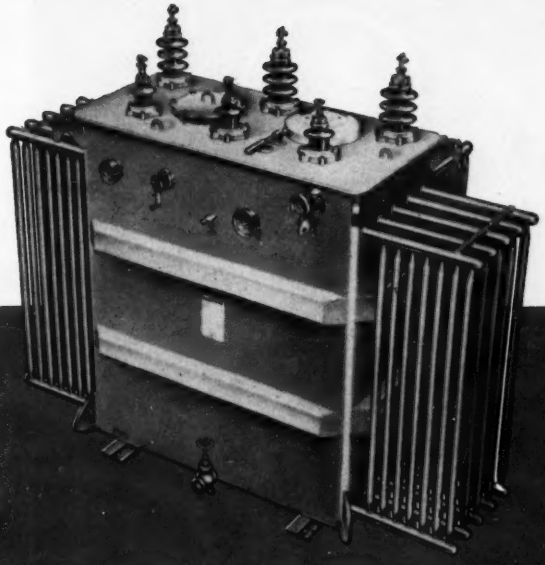
According to the manufacturer, the chemical-resistant qualities of this tape make it especially suitable for use in oil drilling, mining and underground cable operations. The 40-mil thickness and extreme stretch (1,500% breaking point) allow smooth insulation wraps on irregular surfaces.

Dielectric strength is 15,000 v unstretched and 10,000 v at 500% elongation. Electrolytic corrosion factor is 1.0 and insulation resistance, 100,000 megohms.

No. 25 comes in ¾-in. by 15-ft rolls, is green with a white strippable liner to be removed before use. Since it fuses to itself, it requires no adhesive. It is not designed as a sole insulation. Scotch brand plastic electrical tape No. 33 is recommended by the manufacturer as an outer wrap.

(21) **THERMOSTAT** — A miniature metal-enclosed thermostat has a temperature range from −50 to 350 F and is adjustable plus or minus 60 F from its original factory setting. Contacts are rated at 1 amp, 115 v a-c or .5 amp, 115 v d-c. Over-all shell length is 1¼ in. and diameter is approximately 5/16 in. Made by Thomas A. Edison Inc., Instrument Division, West Orange, N. J.

(22) **PLASTIC-CASED BATTERIES**—A new line of light-weight, plastic-cased batteries is available over a capacity range of from 10 to 100 ampere hours, at the 8-hour rate of discharge. Made by Gould-National Batteries Inc., Trenton 7, N. J.



SAVE WITH Power Transformers THAT COMBINE ASA STANDARDS

...AND Westinghouse Quality!

For the first time, the industry has agreed on Standards for power transformers. Westinghouse is ready *now* to supply transformers that meet these Standards.

There are substantial savings when you use Westinghouse *standardized* design transformers.

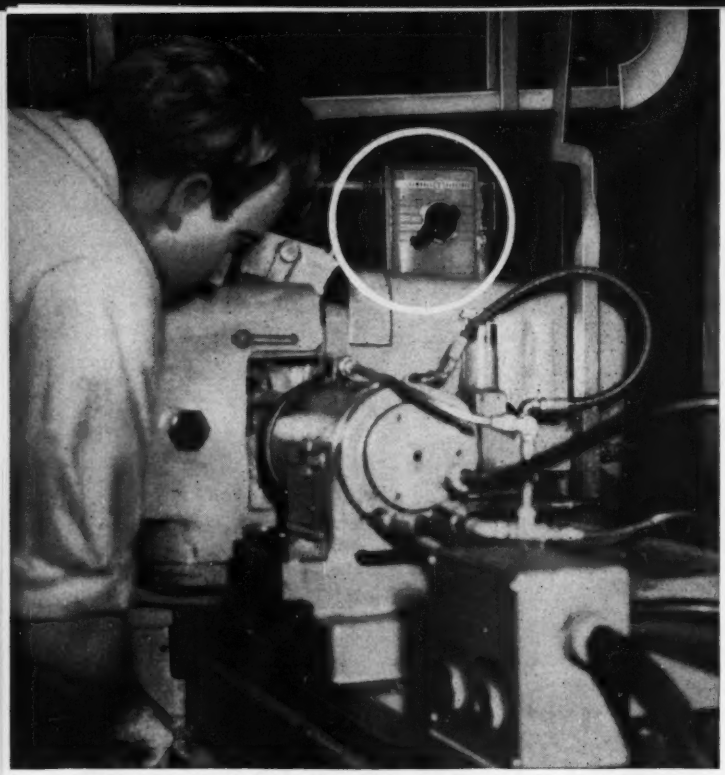
1. A *minimum* reduction of 8% in capital investment.
2. Superior quality that insures reliability of service and a minimum of operating expense.

Your Westinghouse representative will be glad to discuss the application of *standardized* transformers to your system. Call him today, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70617

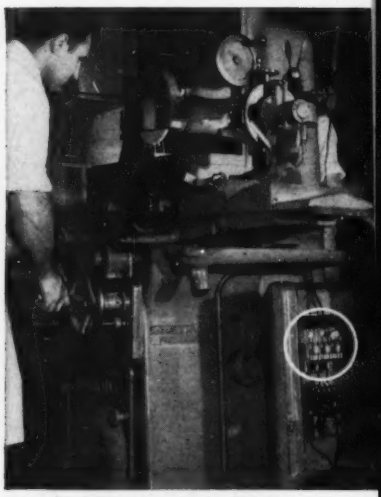
YOU CAN BE SURE... IF IT'S Westinghouse

POWER TRANSFORMERS

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver



IN SAFETY SWITCHES—Marlin-Rockwell Corporation's ball bearing factories use 30 ampere HCI switches as disconnects for high frequency motors used to power internal grinders. HCI interior is removable for easy wiring and inspection. No exposed live parts when switch is OFF and door open. Underwriters' Laboratories Approved.



IN COMBINATION STARTERS—Rugged, simple construction of HCI is perfectly adapted to use as disconnect in combination starters.

SELL NEW SAFETY SWITCH

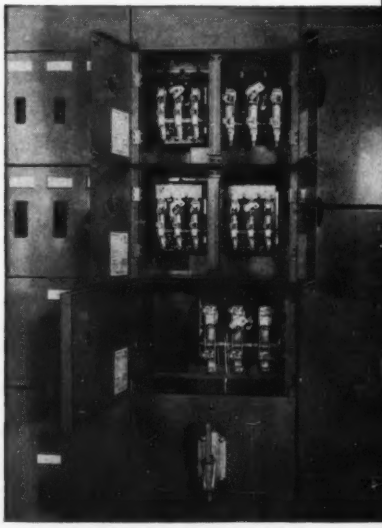
for Multiple Applications

The initial success of Trumbull's HCI (High Capacity Interrupter) as a Type A safety switch has led to its adoption for use as disconnect in combination starters, control centers and switchboards.

The HCI has many selling points. For example—for the first time in a safety switch, magnetic repulsion is used to break load quickly, safely. Double-break contacts are projected and withdrawn with piston-like speed and force. The arcs repel each other and strike against grid pins, breaking into smaller arcs which cool rapidly.

The unique arc-quenching action provides safety, lengthens contact life by preventing pitting, and gives the switch much greater life expectancy. HCI withstands heavy short circuits without damage.

Sell HCI wherever a safety switch or component disconnect is needed.



IN SWITCHBOARDS AND CONTROL CENTERS—Compact 30 and 60 ampere HCI switch interiors can be mounted in twin switchboard units (100 ampere HCI takes same vertical space), saving trough space and providing dependable short-circuit protection and sure ON-OFF handle indication.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLAINVILLE, CONN.

33. OUTLET BOXES: Each switch, light, wall receptacle, clock and other miscellaneous device for flush mounting shall be provided with an approved type of outlet box, iron or steel, sherardized or galvanized to prevent rusting.

All outlets in plastered wallsand ceilings shall be equipped with covers to bring same flush with plaster finish. Outlet boxes and covers shall be Appleton or approved equal.

APPLETON in the specifications MEANS PERMANENCE in the building!

One RELIABLE Source for EVERY Electrical Wiring Requirement

The above specifications are from a recent bank building job—a job that called for lasting dependability, first quality throughout. Appleton fittings were specified because they're precision engineered to meet requirements—made to highest standards in Appleton's own foundries and fabricating plants.

Whether it's a simple installation or an intricate system of wiring for a highly hazardous location, you'll find the exact fittings required in the 15,000-item Appleton Line.

Skilfully designed for fast and easy installation, Appleton fittings provide top performance in any type of electrical construction or maintenance. For faster completion of better jobs, specify Appleton, STANDARD FOR BETTER WIRING.

Sold Through Electrical Wholesalers

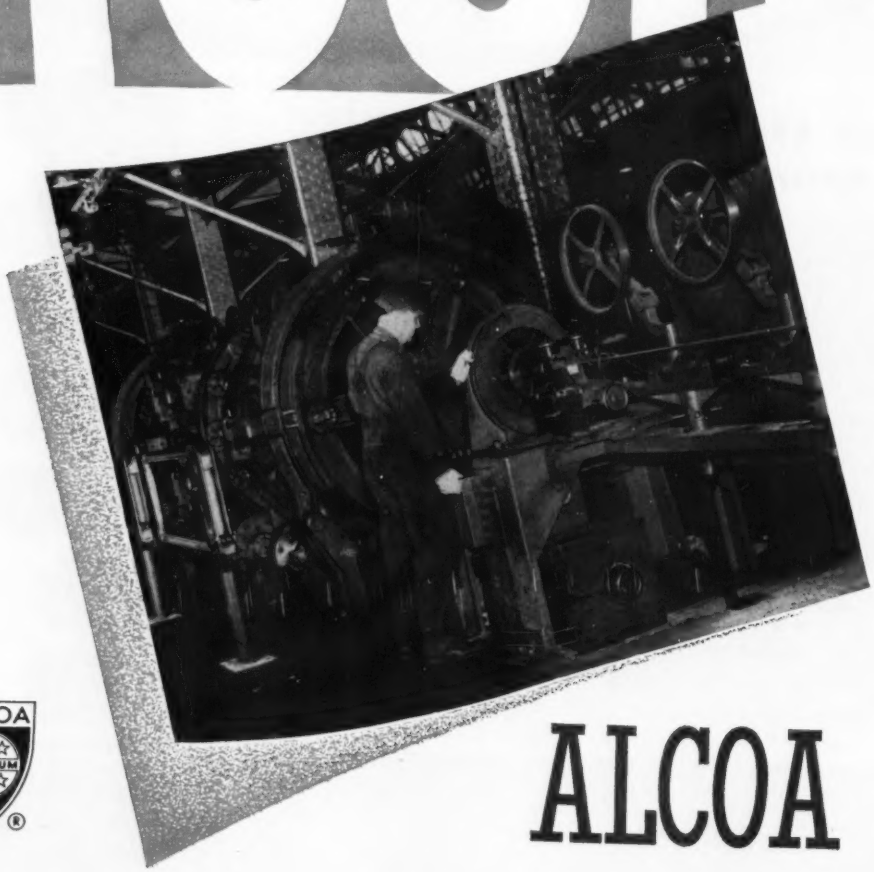
APPLETON ELECTRIC COMPANY
1709 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS
LOS ANGELES 12, 100 N. Santa Fe Avenue
SEATTLE 9, 115 Ray Street
SAN FRANCISCO 1, 655 Minna Street
DENVER 2, 1921 Blake Street

APPLETON ELECTRIC PRODUCTS

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

ACSR



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ALCOA

and Alcoa Workmanship

Over 2,000,000 miles of ACSR have been produced by Alcoa. Positive testimony to the *quality* cable offered by Alcoa.

Today, the same exacting workmanship that governed this total continues to supply you with the best ACSR. Shown here is one of many stranding machines that spins strong, light weight cable at Alcoa's Mills.

Exacting inspections maintain the high standards of Alcoa ACSR. This assures you cable with uniform stranding . . . steel core wire rigidly inspected to meet ASTM specifications . . . cable in uniform lengths, clearly marked on reels.

You get *quality* cable plus Alcoa's 54 years' cable experience. Our field engineers can offer you up-to-date installation and maintenance techniques. Call the nearest Alcoa Sales Office or write:

ALUMINUM COMPANY OF AMERICA
2103D Gulf Building • Pittsburgh 19, Pennsylvania

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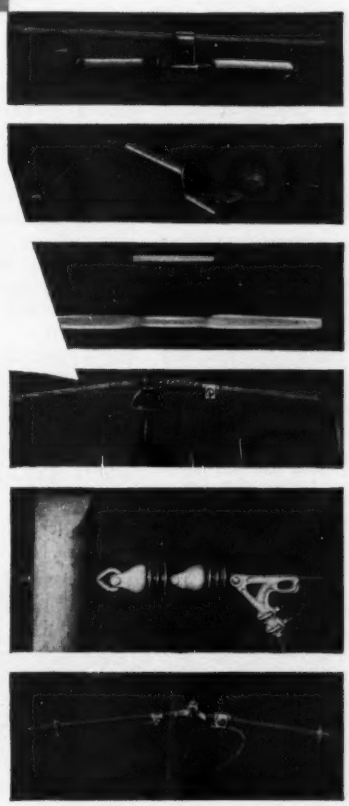
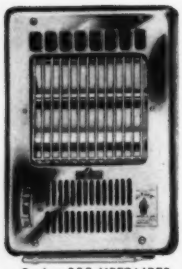
FIRST IN ALUMINUM FIRST IN A·C·S·R

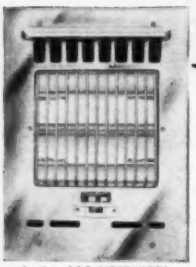
ALCOA ACCESSORIES

Alcoa has developed a complete line of aluminum accessories to help you build your T. & D. lines faster and better.

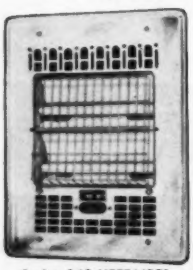




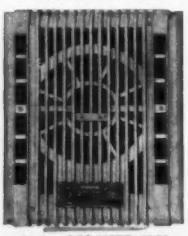
Series 230 HEETAIRES
1250 to 3000 watts



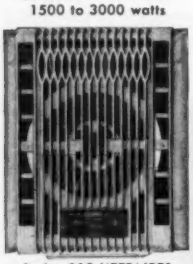
Series 200 HEETAIRES
1000 to 2000 watts



Series 240 HEETAIRES
1000 to 1500 watts



Series 250 HEETAIRES
1500 to 3000 watts



Series 210 HEETAIRES
3000 to 5000 watts

Here's how you can fill every auxiliary heating need of every BUILDER, CONTRACTOR, and HOME OWNER!

HEETAIRES . . . are manufactured in a complete range of types and sizes for every purpose . . .
HEETAIRES . . . range in wattage from 1,000 to 5,000 (120 and 240 volts), produce from 3,402 to 20,472 BTU's per hour — for light, intermediate and heavy duty.

ALL HEETAIRES are available with AUTOMATIC THERMOSTATIC HEAT CONTROLS

All HEETAIRES can produce and maintain any desired temperature between 40° and 80° F. (with only a 2° differential at all times). This insures correct healthful comfort—uninterrupedly—quickly, wherever wanted.

HEETAIRES are available in wall inserts and wall attachables — both with either built-in or external thermostatic controls.

HEETAIRES are available in three heat types — radiant heat, heated air, fan-forced radiant heat.

FAN-GLO HEETAIRES — Series 230 produce both kinds of heat — infra-red rays plus fan-forced heated air.

HEETAIRES Series 200 and Series 240 produce infra-red rays (radiant heat).

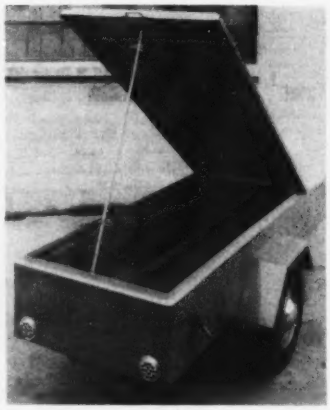
HEETAIRES Series 250, Series 210, produce fan-forced heated air.

Tested and listed under reexamination service by Underwriters' Laboratories, Inc. Thermostatic or Manual Control . . . Radiant Heat, Heated Air and Fan-Forced Radiant Heat . . . Wall Inserts and Wall Attachables.

FREE! Write for the copyrighted "A GUIDE TO QUICK HEATING"

MARKEL ELECTRIC PRODUCTS, INC.
LA SALLE PRODUCTS, INC.

148 Seneca Street, Buffalo 3, N. Y.



Hot Stick Trailer

(23) A. B. Chance Co., Centralia, Mo.

This light-weight hot stick trailer will carry enough tools for most straight line maintenance jobs and a limited supply of dead-end tools, the manufacturer states. Racks on the sides will carry ten hot sticks 10 ft long or more of shorter lengths. A specially constructed tunnel extends from the front of the trailer and permits transportation of three 12-ft sticks.

The steel body is mounted on semi-eliptical suspension springs. The one-piece hinged top has a brace for holding it in the open position. A sliding steel rod is used to support the front end of the trailer when the pintle eye hitch is released from the towing vehicle. The trailer comes with 6:00x16 4-ply tires.

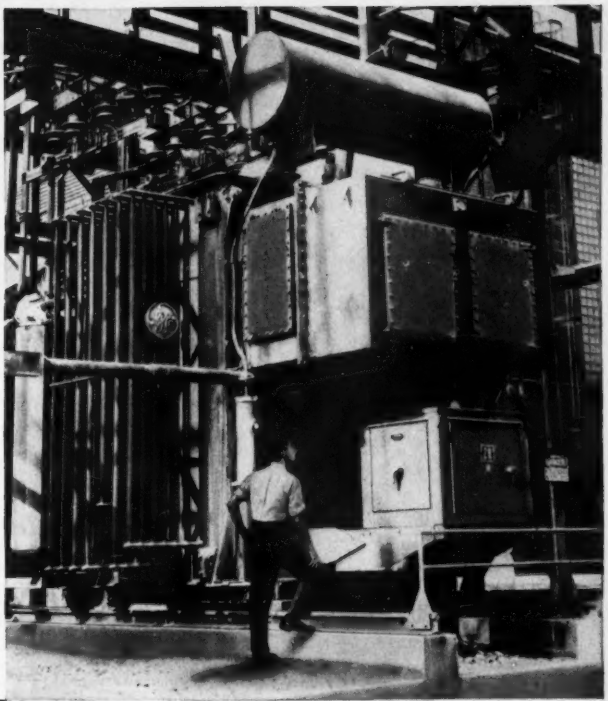
(24) **IMPROVED CASE**—A new one-piece molded Phenolic case is claimed to make the model 41 Levolier switch easier to wire and install. The case is removed by loosening one nut and the two terminal posts are completely exposed. Model 41 is for individual control of incandescent or fluorescent lighting and for FHP motor control. It is made by the McGill Mfg. Co., Valparaiso, Ind.

(25) **LIMIT SWITCH**—R-1,000-A rotating limit switch made by Crane Electric Co., 1437 W. Lake St., Chicago 7, Ill., is designed to control travel of any rotating device requiring interruption or establishment of electric current after a predetermined number of revolutions.

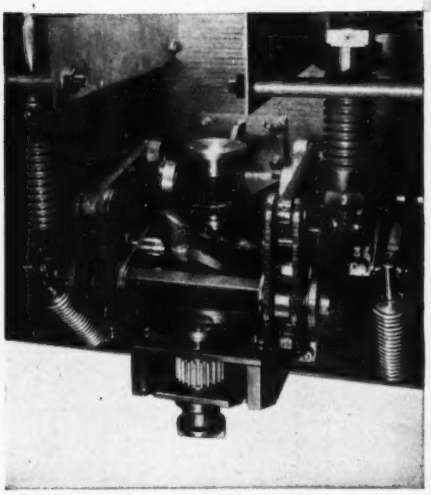
(26) **MASTER SWITCH**—A redesigned heavy-duty G-E master switch has a cast-aluminum cover and up to five adjustable stops. The new cover weighs one-third as much as the previous cast-iron cover, is easy to remove for inspection. Adjustable stops provide for any combination of from one to five points of movement of the operating handle in either clockwise or counterclockwise direction. Details from General Electric Co., Schenectady 5, N. Y.

No appreciable mechanical wear after 1,017,706 tap changes

G-E load-ratio-control averages 800 tap changes a day at Alcoa plant



G-E LOAD-RATIO-CONTROL TRANSFORMER rated 40,000 kva (output) 13.8 kv, installed at Alcoa's Vancouver plant, provides ±5% voltage regulation.



MILLIONS OF TROUBLE-FREE OPERATIONS are built into this hardened steel cam assembly—typical of the mechanical strength of G-E load-ratio-control. Each new LRC design must pass mechanical-life tests of several million operations before it can be approved for production.

The load-ratio-control equipment on this transformer really has to "take it." Installed on January 16, 1946, it has already completed more than a million tap changes under load! At its last inspection on January 17, 1951, Alcoa found the LRC mechanism in excellent working order. None of the mechanical parts—bearings, pins, cam rollers or cam surfaces—showed appreciable wear.

Without a rugged mechanical system, the toughest electrical parts would be worthless. That's why every new LRC design must pass mechanical-life tests equal to at least 30 or 40 years of ordinary service!

Requires less routine maintenance, too!

With G-E load-ratio-control, you don't do any *unnecessary* service work. The instruction book which accompanies each unit tells how many operations you can expect the LRC equipment to perform before you have to replace contact tips and clean insulation.

This means you can eliminate unnecessary inspections. Simply refer to the instruction book and read the operations counter to schedule maintenance only when it is needed!

Over 39,000,000 installed kva have proved that General Electric LRC is as reliable as the core and coils themselves.

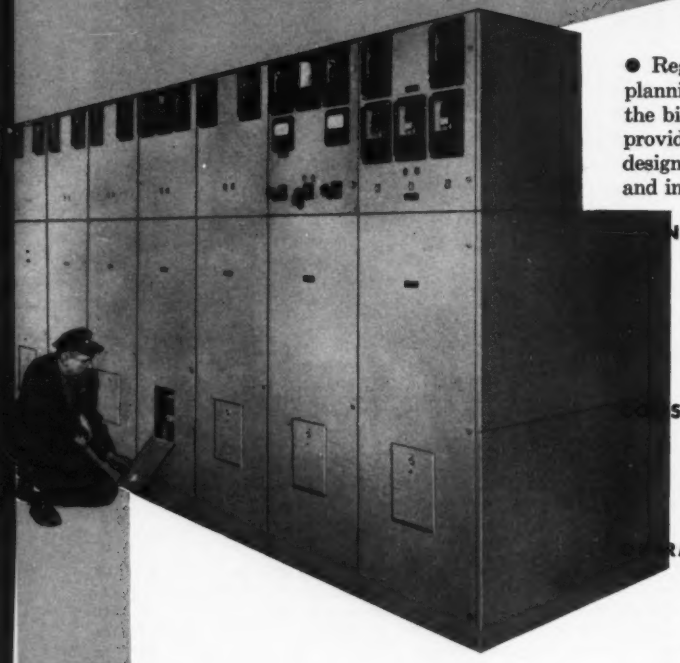
General Electric Company, Schenectady 5, New York.

401-22

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

I-T-E METALCLAD SWITCHGEAR



● Regardless of your engineering responsibility—planning, construction, or operation—you'll welcome the big advantages that I-T-E Metalclad Switchgear provides. Since 1937 the soundness of the I-T-E design has proved itself in central stations, steel mills, and industrial plants the world over.

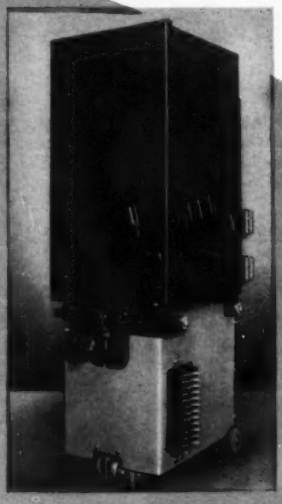
NNING: Planning engineers, concerned with plant wide equipment protection problems in new and expanded distribution systems, prefer I-T-E Metalclad Switchgear because for 15 years, it has assured safe, positive arc interruption. Planning is easier because I-T-E supplies indoor and outdoor equipments in standard structures that are compact, uniform, and readily expandable.

STRUCTION: Construction engineers like the way I-T-E speeds switchgear installation. I-T-E forwards channel bases in advance, so that floors can be prepared ahead of equipment arrival. The arrangement of I-T-E Metalclad Switchgear simplifies the pulling of primary and control cable.

RATION: Operating engineers have to live with switchgear once it's in place. They like I-T-E Metalclad Switchgear because double interlocking makes it safe and easy to operate. The famous "fast-test" feature makes short work of secondary circuit testing—even eliminates opening the breaker door.

4160 VOLTS • 50,000 AND 150,000 KVA INTERRUPTING • 600, 1200, AND 2000 AMPERES CONTINUOUS

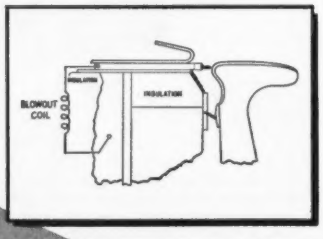
For information, including selection and application data, write for Catalog Section 7004 and Bulletin 7000-A. I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pennsylvania.



PLANNING ENGINEERS

I-T-E Metalclad Switchgear provides safe, positive arc interruption because I-T-E Type HV circuit breakers are used throughout.

When opening short circuit current near rating, the I-T-E HV breaker interrupts the current so quickly that the moving contact travels only about one inch before the circuit is interrupted. Extra contact travel is provided for interruption of very low current.



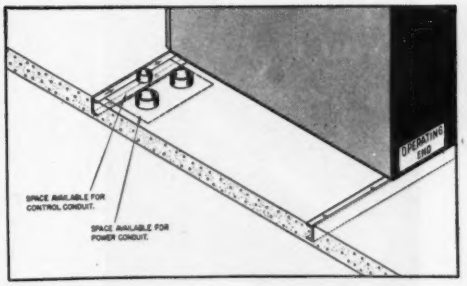
LONG-LIVED INTERRUPTING ABILITY

Arc transfer energizes blowout coil and eliminates metallic connection between front runner and lower current stud. Thus, potential is across arc chute only during arc interruption—resulting in longer chute life.

PROVES ITS ENGINEER APPEAL

CONSTRUCTION ENGINEERS

I-T-E provides switchboard floor plans, front view drawings and single line diagrams well ahead of shipment. When you're ready, I-T-E forwards channel bases—your equipment goes in right on schedule! Control and primary cables can enter structure at top or bottom. Control cable connections are located just inside the removable rear panel. You have them completely accessible for inspection and checking *without* de-energizing the circuit, *without* removing the breaker, *without* entering the switchgear structure.



OPERATING ENGINEERS

Important operating advantages of I-T-E Metalclad Switchgear save steps and guard your safety. Here are just a few of them:

1. Secondary circuit testing without removal of breakers from the stationary structure. No separate operqtion of secondary disconnecting devices is required.
2. The double interlock assures complete safety of personnel and equipment—guards against improper insertion or withdrawal of the circuit breakers. Interlocks are built into the circuit breaker—eliminating complicated engagement mechanisms between the breaker and structure. Adjustments are simplified and interchangeability is assured.
3. Circuit breaker control-relay is mounted on breaker truck; (when breaker comes out, relay comes out. No "climbing" into structure to inspect control-relay).
4. Truck-mounted horizontal removable elements eliminate hours of maintenance usually required for complicated elevator mechanisms.

Full operating positioning is accomplished by mechanical racking.

Specify I-T-E **METALCLAD SWITCHGEAR**

I-T-E CIRCUIT BREAKER CO. • 19th & HAMILTON STS. • PHILA. 30, PA.

R&IE Equipment Division, Greensburg, Pa. • Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

KLEIN

Talk to any old-timer on the job and he'll tell you Klein equipment is his choice for comfort—for safety—for service. Look for the familiar Klein trade-mark on pliers, safety straps and belts, climbers, grips and wrenches. Klein has been serving the electrical industry "Since 1857."

ASK YOUR SUPPLIER

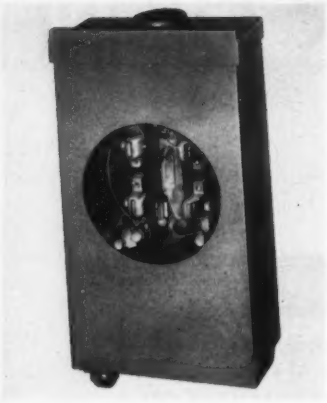
Foreign Distributor: International Standard Electric Corp., New York

Write for your free copy of the Klein Pocket Tool Guidetoday!

"Since 1857"

Mathias Established 1857 KLEIN & Sons Chicago, Ill., U.S.A.

3200 BELMONT AVE. CHICAGO 18, ILL.



Heavy-Duty Meter Mounting

(27) Murray Mfg. Corp., 1250 Atlantic Ave., Brooklyn 16, N. Y.

A heavy-duty meter mounting device, with a maximum current-carrying capacity up to 200 amp, can be used with any standard 4- or 5-terminal self-contained socket-type meter, single-phase, 3-wire network or 3-phase, 3-wire. Vise-jaw terminals are made of high-strength high-conductivity bronze operated by a standard ½-in. hex-socket wrench. Bolt-type pressure connectors take line conductor sizes from No. 6 to 4/0.

The unit has a transparent acetate shield for safety during installation or testing. By-pass clamps permit removal or testing of meter without interrupting the load.

The case, which measures 9x18x4½ in., can be supplied with 2- or 2½-in. threaded hubs and 2½-in. knockouts in the bottom and ½- and ¾-in. knockouts for optional grounding at meter enclosure. It can be mounted in gang for multiple high-capacity meter installations.

(28) **DEODORIZER** — The Vitozone, made by Kisco Co. Inc., St. Louis, Mo., uses ozone generated by a Westinghouse Odorout lamp. It is mounted in a metal fixture, finished in eggshell white with polished aluminum reflector and has an 8-ft cord. A key slot in the back provides for wall mounting. The unit comes in two models, the V-1 with one lamp for areas up to 1,000 cu ft and the V-2 with two lamps for those up to 2,000 cu ft. Odorout lamps have an effective life of 4,000 hours.

(29) **RECEPTACLE** — A T-slot duplex receptacle has double-blade contacts made of a special phosphor bronze without riveted connections. Comes in brown and ivory, both with solid all Bakelite back. Listed by Underwriters' and CSA, 15 amp, 125 v; 10 amp 250 v. Made by Eagle Electric Mfg. Co., 23-10 Bridge Plaza S., Long Island City 1, N. Y.

We Can Make YOUR POLES LAST LONGER

WITH AN

OSMOSE

INSPECTION AND TREATING PROGRAM

This program, performed by our highly skilled crews, can save your system hundreds of thousands of dollars in REPLACEMENT COSTS by:

1. Absolutely arresting groundline decay of your poles and
2. Giving you up-to-date pole records.

Treatment charge is as low as 4% of replacement costs and pole life is extended for approximately 8-10 years. Let us send you ALL the details!

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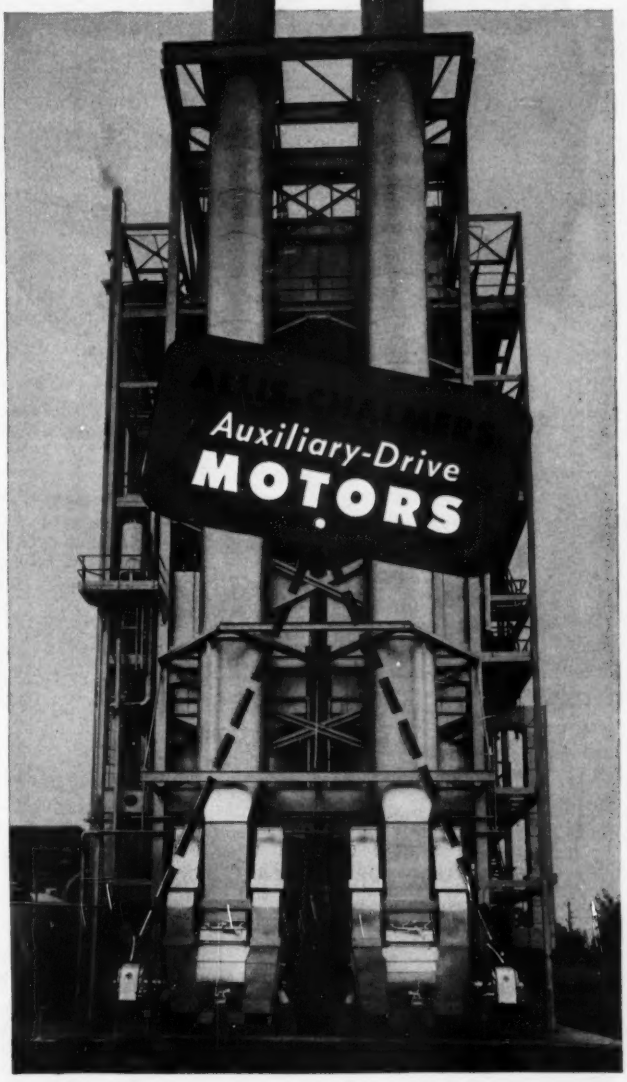
DAN KAMPHAUSEN CO.

CONTINENTAL OIL BLDG., DENVER 2, COLO.

No "Cover" Charge Here!



THE INDUCED-DRAFT FAN MOTORS look pretty small right out in the open air at the base of the towering stacks. But with today's building costs there would have been nothing small about the "cover" charge for brick and mortar walls and a steel-braced roof to house the motors.

Fortunately, modern Allis-Chalmers auxiliary-drive motors need no costly enclosures.

You can count on Allis-Chalmers motors for the kind of operation you need for continuous power generation . . . because A-C has the experience essential to designing and building motors for outdoor use.

For many years, A-C has been supplying splash-proof motors for a variety of outdoor applications. Since 1946, *tube-type* totally-enclosed fan-cooled motors have been available for operation under the most severe conditions indoors or out. And Allis-Chalmers is now offering *weather-protected* motors especially developed for modern outdoor power plants.

Talk Over Your Needs

All three types are available in sizes and speeds to meet all major auxiliary-drive requirements. Your nearby A-C representative can help you select the motors that will best fit your needs for money-saving outdoor installations. Allis-Chalmers, Milwaukee 1, Wis.

Two 450-hp, 695-rpm, splash-proof cage motors driving induced-draft fans — as well as other Allis-Chalmers auxiliary-drive motors — are installed outdoors at the Natchez Steam Electric Station of the Mississippi Power and Light Company.

A-3653

ALLIS-CHALMERS

Lapp
Insulator Co. Inc. LeRoy, N.Y.
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UNITED STATES RUBBER COMPANY
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CARMA MFG. CO.
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DUAL SILVER POINT — FULLY AUTOMATIC
FLUORESCENT STARTERS

—completely eliminate annoying blinking and flickering of dead fluorescent lamps!

REFLECTS THE CRAFTSMAN'S SKILL

GUARANTEED — FOR ONE YEAR!

This is a glow switch condenserless precision starter equipped with automatic thermal relay circuit breaker. The relay automatically removes the lamp from the circuit electrically when the lamp becomes deactivated and automatically resets upon interruption of the lamp circuit.

SIMPLIFIES—Replacement of defective lamp automatically recycles starter circuit. No buttons to push—no replacement of starter.

REDUCES COST—Magno-Tronic starters provide exact timing of electrode heating, preventing excessive loss of emission material, thus assuring maximum possible lamp life.

VERSATILE—Built to operate efficiently over an extended voltage and temperature range.

SP-15-20 For use with 15 or 20 watt lamps.
SP-30-40 For use with 30 or 40 watt lamps.
SP-85-100 For use with 100 watt lamps.

Manufactured under U. S. PATENTS
2298236 2159837 2339307
2334935 2239244 2333694
2341520 1849552
Other Patents Pending

INDUSTRIAL ELECTRONICS CORP.
General Offices & Main Plant, 80 BANK STREET, NEWARK 2, N. J.

Capacitor for Low-Voltage Distribution

(30) Westinghouse Electric Corp., 306 4th Ave., Pittsburgh 30, Pa.

Increased capacity for the transformer, better voltage regulation for the customer and more revenue for the power company are benefits claimed from a recent development that in effect enables the capacitor to leap-frog the distribution transformer from the high-voltage to the secondary side. According to its manufacturer, by exercising design and construction economy, a 3-kva single-phase 240-v shunt capacitor has been made low enough in cost that one can be inserted in each secondary line of a transformer of 15 kva or larger.

The unit is housed in an extruded aluminum tube with a porcelain insulating lid. The assembly is about 16½ in. long and 4½ in. in diameter. It is connected to the line by a wire small enough to act as a fuse in case an internal short circuit develops.

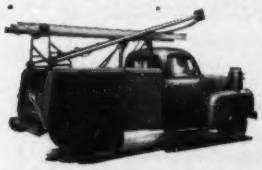
(31) **RECORDER** — An independently powered miniature strip chart recorder with an electronically actuated pen is available from the Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio. Known as the Autronic recorder, it is the graphic indicator for manufacturer's Autronic control system for chemical and food processing plants, refineries, petrochemical installations, central stations and industrial power plants. It is an electronic servo-powered null-balance device claimed to create a highly accurate and instantaneous record of the measured variable.

(32) **ATTIC FAN** — Robbins & Myers, 387 S. Front St., Memphis, Tenn., is offering a compact vertical-discharge attic fan that measures 3 ft square and projects 17½ in. above the attic floor. An improved ceiling shutter opens and closes automatically as the fan is turned on or off. Available in 4,750 and 6,800 cmf capacities.

UTILITY WORKHORSE-

LINE CONSTRUCTION BODY (500)
Medium and heavy duty work. Vertical compartments are optional . . . can be equipped to fit individual needs.

REVOLVING AERIAL LADDER
Models available in working heights of 23' 6", 26' 6", 30' 6", and 32' 6" for all styles of bodies.



LIGHT DUTY MAINTENANCE BODY (350)
Fold-over type derrick will handle poles up to 40' in length. 24' ladder extends from rear of body.

HYDRAULIC TOWER
Available in sizes from 21' to 30'. Platform revolves full 360°. Tower can be operated from cab or platform.

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

FOR LONG LIFE AND TROUBLE FREE SERVICE

All *Powers-American* bodies have *earned* the reputation of "workhorse" of the utility industry by years of faithful performance. No matter how tough the job or the operating conditions, they pull more than their share of the load by stepping up crew efficiency and lowering operating costs. Whatever your utility body needs, *Powers-American* is your *1* source for *all types* of utility bodies and equipment. Write today for more information. Put a *Powers-American* "workhorse" on your job and watch the team pull ahead!

"The Accepted Standard with Utilities Everywhere"

LINE CONSTRUCTION BODY (600)
Completely equipped to carry all tools and materials needed for line work. Can be furnished with winch and derrick, compressor, digger, or any special equipment required . . . for use in any phase of the utility industry. Available in 9' to 14' lengths, with or without built-in crew compartment.

POWERS *American* DIVISION
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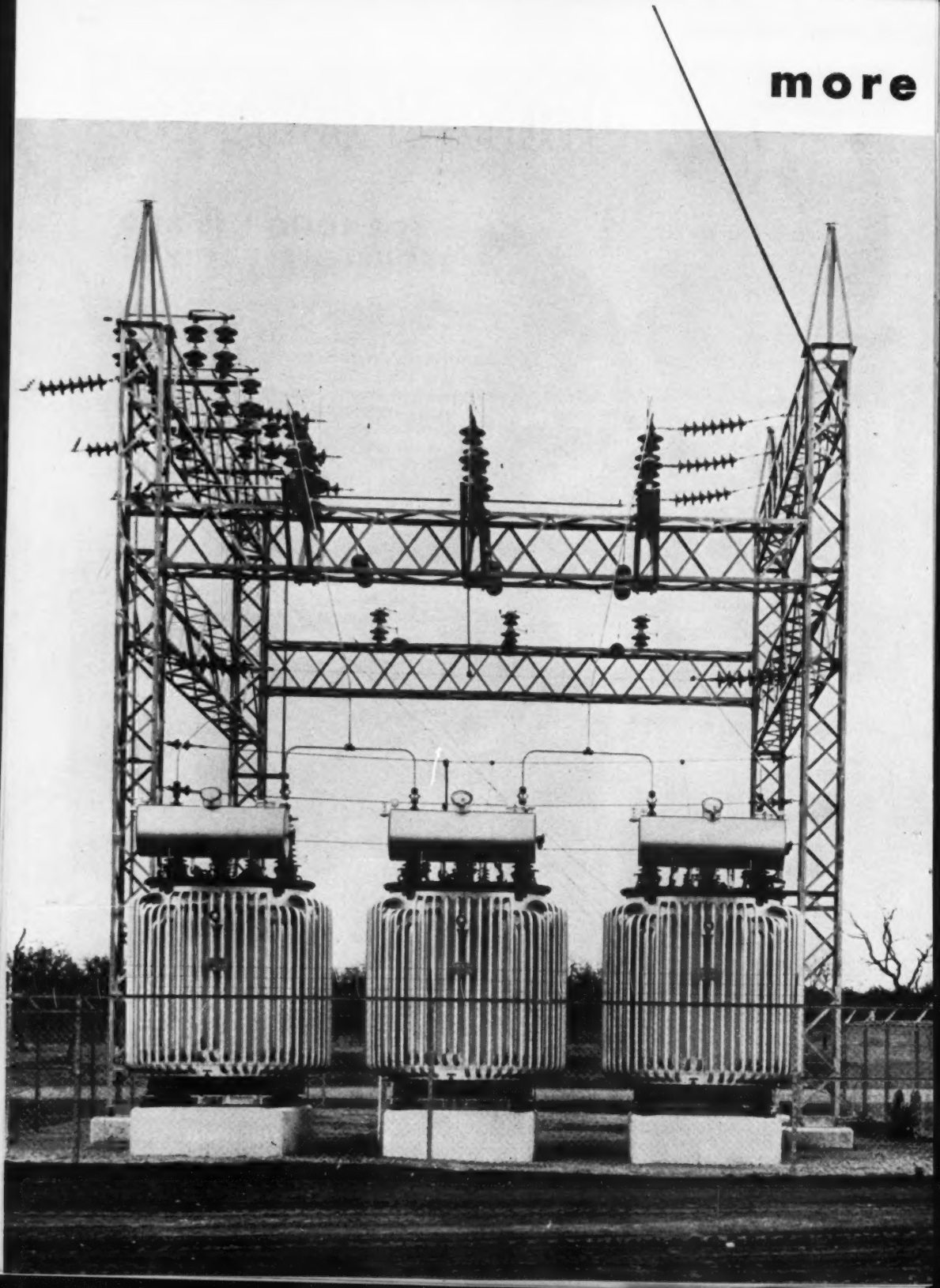
PUBLIC UTILITY BODIES AND EQUIPMENT

[illegible] AUTO BODY COMPANY
5900 North Broadway, St. Louis 15, Mo.
WESTERN OFFICE: Latham Square Bldg., Oakland 12, Calif.

more



power for Texas oil

A big industry like the oil industry needs reliable equipment. That's where Kuhlman comes in. These three Kuhlman Power Transformers—each 1500 KVA, single phase, rated at 69 KV—are part of the pumping system of one of the world's largest pipeline companies, located in Texas.

This company, along with many other transformer users, knows that the name Kuhlman represents 58 years of expert engineering and solid construction.

It is significant that Kuhlman, a pioneer in transformer manufacture, continued to find ways to improve an already highly standarized product. Many of these improvements are now standard.

Whenever you have a transformer requirement—large or small—call the Kuhlman representative in your vicinity. If you don't have his address, write us.

KUHLMAN ELECTRIC

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Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

The complete Kuhlman line includes power, distribution, dry type, Saf-T-Kuhl, and specialty units. Write today for descriptive bulletins. For information on power transformers, ask for Bulletin CS-601.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N.Y. Cable Address, Microphone, N.Y.

THE NEW

OHIO

MOTOR AND GENERATOR BRUSH WALL CHART

For easy selection, brushes are pictured and arranged in groups showing styles with dimensions—a time saver when making brush replacements. Write for your copy.

- Complete Factory Stocks at TRI-STATE!
- Pre-tested Quality Brushes by OHIO!
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SEATTLE 4 • 318 Occidental Avenue Main 4161

BULLETINS ETC.

(33) GUIDE — The proposed AIEE guide for the use of openly ventilated dry-type transformers with class B insulation is contained in an 8-page bulletin offered by Allis-Chalmers Mfg. Co., 939 S. 70th St., Milwaukee, Wis. The guide gives general recommendations on installation, inspection, storage, maintenance and operation. It includes distribution and power dry-type transformers in ratings above 50 kva and above 600 v, cooled by natural draft or forced draft. The bulletin is listed as 61X7088B.

(34) UNDERLOAD TAP CHANGERS — Catalog 5112 from Pennsylvania Transformer Co., Box 330, Canonsburg, Pa., covers underload tap changing equipment for single-circuit unit substations in all sizes and voltages; step voltage regulators, three phase in voltages up to 750 kva; load ratio control transformers up to 7,500 kva. Described is the manufacturer's new Silent Snap switch.

(35) CLAMPS—Data sheets on Cooline suspension and strain clamps in aluminum and bronze have been prepared by Ohio Brass Co., Mansfield, Ohio.

(36) LIGHTING EQUIPMENT—Price list No. 24 superseding the 1951 list has been published by Fluorescent Fixtures of California, 3320 18th St., San Francisco 10, Calif.

(37) TIMERS—A 2-page bulletin from Tork Clock Co. Inc., Mount Vernon, N.Y., gives information on its attic and ventilating fan timers, its kitchen timers and defroster.

(38) GROUNDING SHEATH CONNECTORS — A new grounding sheath connector is described in data sheet 85 from the Thomas & Betts Co., 70 Butler St., Elizabeth, N. J. It is a two-piece compression-type connector made for terminating and grounding braided shields on wire and cable used in radar, critical radio and audio frequency circuits and for UHF.

(39) INDUSTRIAL HEATER — Electromode Corp., 45 Crouch St., Rochester 3, N. Y., is offering catalog EC-62R giving specifications of its suspension-type, combination portable and suspension, and explosion-proof heaters. Included are data on control equipment, mounting and wiring diagrams and illustrations.

(40) LIGHTING PANELBOARDS — Bulletin 513 discussing P2B and P3B Pushmatic Electri-Center panelboards is offered by BullDog Electric Products Co., Detroit 32, Mich. According to the manufacturer, these are now available off the distributor's shelves, the customer specifying type of interior, front and the number and rating of the circuit breakers he desires.

(41) INSULATING MATERIALS—Electric insulating materials produced by G-E are described in bulletin CDL-35. Properties and applications of the manufacturer's varnishes, Glyptal alkyd resin insulating finishes, varnished cloths and tapes, sealing and filling compounds and silicone insulating materials are described. The bulletin may be secured from the Chemical Division, General Electric Co., Pittsfield, Mass.

(42) F MERCURY LAMPS — Information on JH-1 fluorescent lamps is contained in a 4-page bulletin, A-6007, from Westinghouse Electric Corp., Lamp Division, Bloomfield, N.J. Recommendations for application, comparisons with light from other lamp sources and tables of technical and transformer data are given. Luminaires designed for the JH-1 are presented.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good After June 1

Please send me, without obligation, the new product information or catalogs described on the following pages and identified by numbers circled below:

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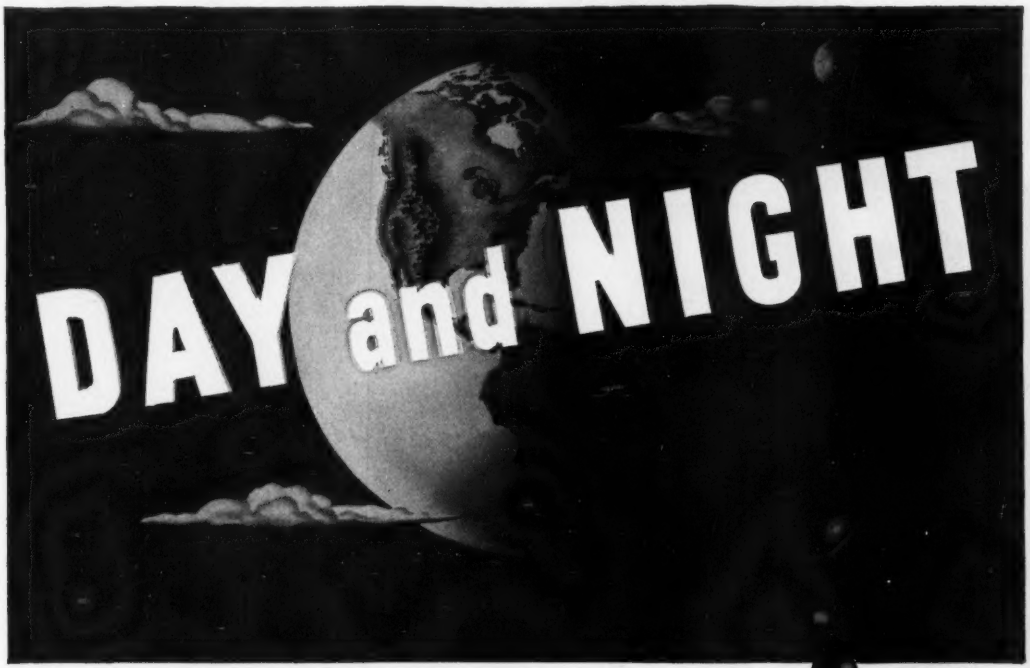
* Please include your company's name and your position, since we cannot ask manufacturers to furnish literature unless you do.

MOLONEY *POWER* TRANSFORMERS

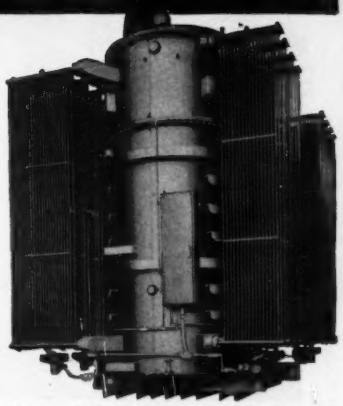
are at work . . .



WHEREVER electricity is transmitted and distributed . . . here in the United States, or in places far remote . . . you will find Moloney Transformers and Regulating Equipment. An ever growing market has been accepting and using our product since 1896. In all this time the name Moloney on a Transformer has come to mean that better performance and greater reliability can be expected of that transformer. We are proud of our reputation and proud of your confidence in us.

Our efforts in engineering, research and design are directed toward the maintenance of this leadership and the result is . . . a better product today . . . an even better product tomorrow.

MED2-1



Illustrated, Moloney Power Transformer rated 35,000/46,667 Kva, 3-phase, 60 cycle 138,000 Grd. Y to 13,200 volts.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

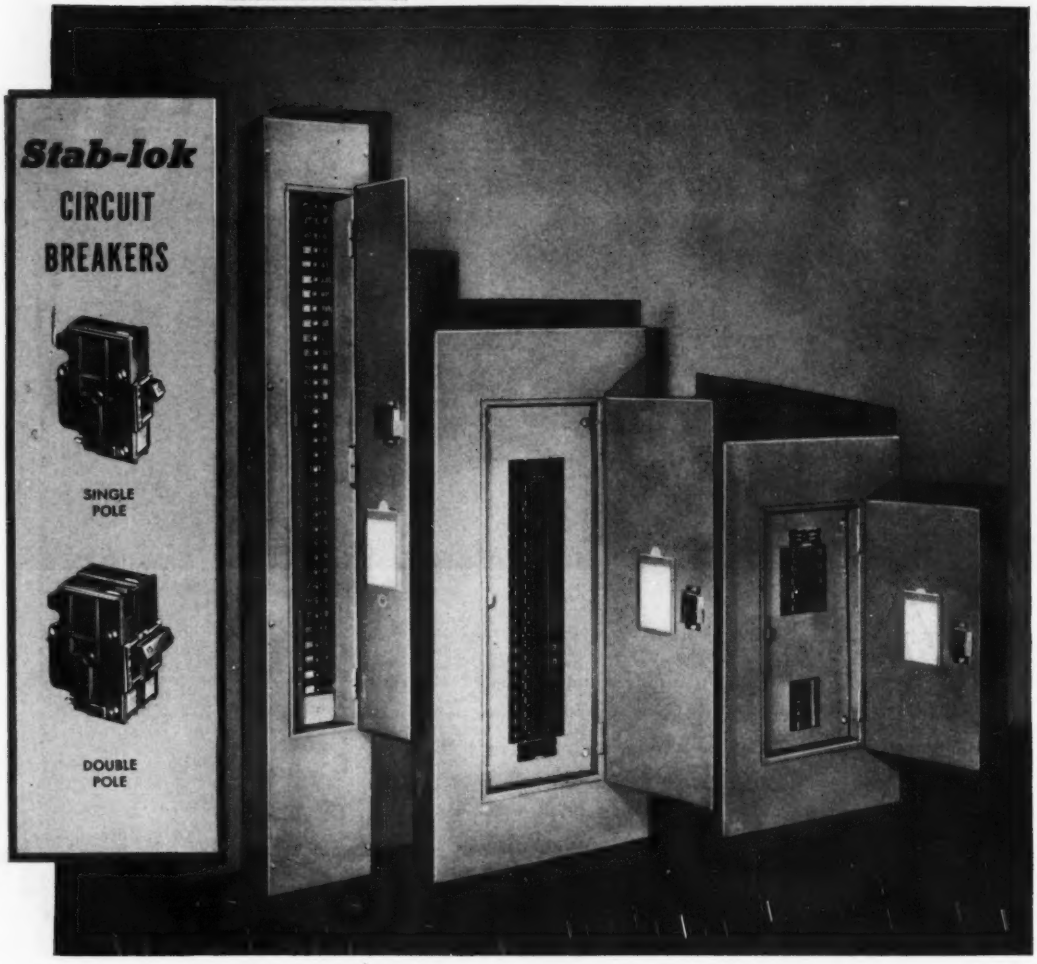
MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

WHY WAIT? IN MINUTES

Stab-lok

REGISTRATION APPLIED FOR



NO MORE WAITING for factory panelboard assemblies. Simply get the correct size enclosure and the required number of one and two pole Stab-lok Circuit Breakers from your distributor's stock and assemble your panelboard in minutes. These Federal Noark Panelboards meet most any requirement, too, for they're available up to 42 circuits.

And when you install Stab-lok Panelboards you get the time- and money-saving advantages of Federal Noark modern design. There are 4½" gutters for easy wiring . . . and the whole interior is quickly removable to give you complete box accessibility for wire pulling. The trim lines up automatically. Polarity sequence bussing provides complete flexibility for most any circuit requirement.

For on-the-spot delivery and today's lowest costs, order Federal Noark Stab-lok Panelboards from your distributor.

Federal Electric Products Company, 50 Paris St., Newark 5, N. J.

—— YOU CAN ASSEMBLE

PANELBOARDS

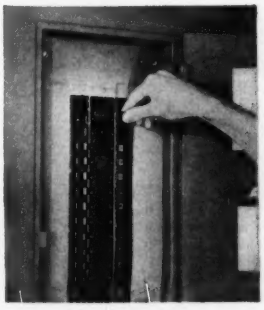
WHY STAB-LOK PANELBOARD IS QUICKEST, EASIEST TO INSTALL

BREAKERS SNAP IN PLACE: Just snap Stab-lok Circuit Breakers in place! All you do is slide end of breaker over rugged metal hook and press the 4-way stabs into proper slot in bussing. No screws! No tools! Slots take either single or double pole Stab-lok breakers.

REMOVABLE INTERIORS: Stab-lok Panelboard interiors are mounted on a back plate. Simply lift interior from box. This gives complete box accessibility for quick wire pulling. To replace, merely hang the interior on support bracket.

ONE MAN INSTALLATION: Mounting Stab-lok Panelboard trim is a cinch for one man. Trim hangs on a support bracket, leaving wireman's hands free to work. Trim mounting screw holes always line up automatically.

AUTOMATIC ALIGNMENT: If box is installed at an angle, shift (trim front) to vertical and tighten trim holding screws. And springs force breaker assembly against front, giving automatic plaster alignment.



DEAD FRONT FOR SAFETY: Filler plates are available to fill unused spaces and give the panelboard a solid, unbroken front eliminating danger of contacting live terminals. With trim installed and door locked, panelboard is tamperproof.

COMPLETE FLEXIBILITY: Polarity sequence bussing provides a flexibility that meets most any circuit requirement. All breakers are interchangeable and can be replaced by breakers of other ampere ratings. You just pry them out.

FEDERAL NOARK

Federal NOARK

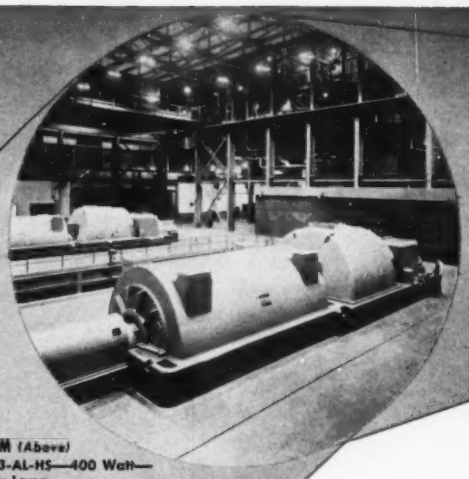
Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

HOLOPHANE

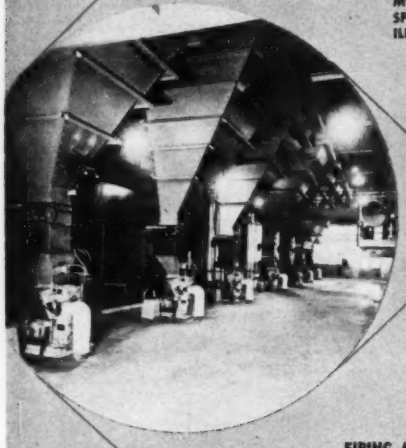
Modern Lighting in a Modern Plant . . .

•

TITUS STATION,
Metropolitan Edison Co.
Reading, Pa.
ENGINEERS: GILBERT ASSOCIATES, INC.



TURBINE ROOM *(Above)*
HIBAY NO. 693-AL-HS—400 Watt—
E-H1 Mercury Lamp
HIBAY NO. 690-AL-HS—750 Watt—
Incandescent Lamp
installed as twin units.
MOUNTING HEIGHT: 40 feet
SPACING: 17′ x 28′ on centers
ILLUMINATION: 30 footcandles in service

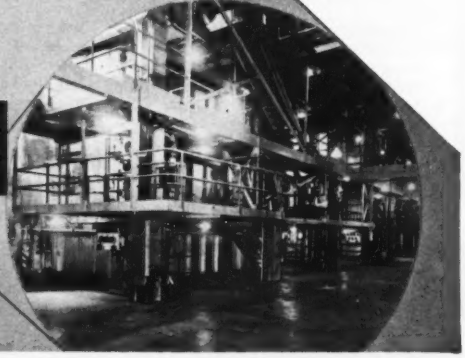


• FOR TROUBLE-FREE ILLUMINATION, each specific area requires individual treatment to assure proper quality and quantity of lighting. Holophane installations provide economies substantiated by analysis. A variety of HIBAY* and LOBAY* reflectors have been designed for the severe conditions typical of industrial plants.

An ideal combination:
Holophane Reflectors using
Mercury and Incandescent light sources.

** Engineering Services are rendered, and recommendations submitted, without charge, through professional advisers.*

FIRING AISLE *(Left)* **And**
BOILER ROOM *(Below)*
LOBAY NO. 685—500 Watt
NOS. 02470, 02470-BC—150 Watt
ILLUMINATION:
Platforms—10 footcandles in service
Aisles—25 footcandles in service



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Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N. Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

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Our record of dependability speaks for itself

Power-line companies that use Bell System Communications have dependable service. Continuous preventive maintenance, backed by 75 years experience in the communications business, insures that dependability.

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We offer a wide variety of services, using cable, radio and wire. This enables us to fit communications to your individual requirements.

You are interested in good, dependable communications. The record shows we can provide just that.

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Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

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MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

ELECTRA'S HUSBAND

TAXES, TAXES AND TAXES

"TALKING to yourself again, I see," Electra said one Saturday afternoon last month. "What's wrong now?" She had slipped into the living room without my hearing her, and was standing beside the card table where I was working. The table was piled with papers including a year's bank statements and canceled checks. Crumpled sheets of scratch paper littered the floor.

"Damn the damned, damned income tax," I said savagely. "I've figured it three times with a different answer each time. I wish that the congressman who wrote the sixteenth amendment to the Constitution had died at childbirth and that everybody connected with the Internal Revenue Department was in hell. Did you ever try to figure out the alternative tax on Schedule D provided you made a long-term capital gain?"

"No, because that's your job," she said. "If I had to do it, I could though."

"I was going to remark that like hell you could, but let's skip it," I continued. "One thing I can say is that we might as well forget about spending money to redecorate the living room. That goes for some of the other things we were going to buy. When we finish paying Uncle Sam there won't be much left."

"You ought to be glad that you can pay an income tax," Electra commented. "That's what the girl down at the collector's office told me when I went down to get a blank stamped 'AMENDED' for you."

"Do you realize that we are actually worse off this year than we were back in 1940?" I asked. "When we get through paying income taxes, we won't have as many real dollars left as we had back before World War II."

"Elliot Bell, editor and publisher of *Business Week*, told us that when he was out here last fall," she reminded. "I've forgotten the figures, but the more money you make, the worse off you are today."

Rummaging around among the papers on the table, I picked up a letter from one of the brokerage houses in the city.

"There is a tabulation in this letter that tells you," I said. "A married man with two children making $3,000 a year net in 1940 didn't pay any income tax. Taking inflation and today's income taxes into account, he would have to have earned $6,072 in 1951 to be as well off. Mr. Bell talked about someone making $10,000 back in 1940 and also about the $75,000-a-year corporation executive for whom my heart bleeds. Just to break even today the $10,000-a-year man would have to earn $22,850 after deductions while the utility president in the upper bracket would have to make $435,088.

"If you want to see where we are today, look for yourself," I said, handing her the table.

"Ouch!" she exclaimed, glancing at the figures. "We can't ever break even."

"Oh yes, we can," I contradicted. "We can come close if Congress will only clamp the lid down on spending. But we won't ever do it with budgets that total $85 billion. Have you any idea how much that is?"

"No," she said. "Have you?"

"Well, if you try to picture how much one billion is maybe you can comprehend the larger figure," I continued. "If you went into the stock market today with $1 billion you could buy the entire amusement industry. At today's prices you would get all of the common stock in Columbia, Paramount, Twentieth Century, Universal, Republic, RKO and Warner Brothers. When you finished buying up Hollywood, you would still have enough to buy the Columbia Broadcasting System, RCA, the American Broadcasting Co., Admiral, Philco, Decca, Emerson, Motorola and Zenith. Before you were through you would own all of the common stock in 21 companies."

"That's a staggering amount of money," she said.

"Multiply it by 85 and you could buy up all of the railroads and the electric companies as well," I said. "The only way we can get our taxes down is to insist on less waste in government. The people in Congress must really do something about economy in government instead of just talking about it."

"What do you propose to do," she asked.

"Write some letters to our congressmen," I said. "Get out the portable typewriter and I'll dictate one right now," I continued, at the same time clearing a space on the table for the machine.

TAXES, INFLATION AND INCOME

PERSONAL INCOME NECESSARY TO MAINTAIN PURCHASING POWER*

MARRIED COUPLE, TWO CHILDREN

1940			1951†				
Net Income (Income After Deductions)	Tax	Net Income After Tax	Net Income (Income After Deductions)	Tax	Net Income After Tax	Loss From Depreciation of Dollar	Net Income After Taxes & Depreciation of Dollar
$3,000	$	$3,000	$6,072	$ 816	$5,256	$2,256	$3,000
5,000	75	4,925	10,542	1,913	8,629	3,704	4,925
6,000	114	5,886	12,912	2,600	10,312	4,426	5,886
8,000	246	7,754	17,759	4,174	13,585	5,831	7,754
10,000	440	9,560	22,850	6,101	16,749	7,189	9,560
15,000	1,118	13,882	37,931	13,610	24,321	10,439	13,882
20,000	2,143	17,857	57,057	25,772	31,285	13,428	17,857
25,000	3,571	21,429	76,322	38,778	37,544	16,115	21,429
50,000	13,741	36,529	222,704	158,705	63,999	27,470	36,529
75,000	27,293	47,707	435,088	351,505	83,583	35,876	47,707

*Sources: Treasury Department; The Conference Board.
†Based on new rates effective November 1 applied to 12 months.

GET *Low Cost* LOAD CHECK WITH THE NEW Thermalite OVERLOAD INDICATOR

LOOKING FOR AN INEXPENSIVE, practical way to load survey your distribution system? Why not investigate the advantages of the new *Thermalite* overload indicator now available in Allis-Chalmers transformers. This simple, reliable device will:

1. Offer a continuous visual load check that may be conducted from your service truck.
2. Locate transformers carrying high loads; eliminate extensive and costly area surveys.
3. Provide a visual check on transformers in hard-to-get-at locations.

Thermalite overload indicator lights up brilliantly in response to high oil temperatures — and remains lighted during the overloaded conditions until reset manually with the convenient reset handle. Though the signal device locates overloaded transformers visually, it *does not interrupt service.* It's quiet in operation, low in cost . . . and is engineered, calibrated and installed in the transformer at the factory.

You'll find that the *Thermalite* overload indicator will offer economies never before possible. You will be able to keep more up-to-date records on transformer performance — permitting you to schedule transformer replacements or load rearrangements during daylight hours. It will help to eliminate emergency service interruptions, costly maintenance and possible burnouts.

For more facts and a demonstration of its operating principle, call your nearby Allis-Chalmers district office. Or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

Allis-Chalmers
Milwaukee 1, Wisconsin
Please send me:
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These 500 MCM Deltabeston AVA cables carry 470 amperes —150 amperes more than standard 60 C cables of the same size. This can mean more current from your present conduit—extra current from every pound of copper.

How much extra current can AVA cables carry?

These standard 500 MCM 60 C cables carry 320 amperes — 32% less current than the same size G-E Deltabeston* AVA cables. Deltabeston cables permit operation at increased temperatures — offer more current per pound of copper.

If you're planning new distribution or changes in your existing wiring system, it will pay you to look into the savings of G-E Deltabeston AVA cable. Deltabeston can actually offer as much as 64% more current from your present raceways—can offer more current in most wire sizes.

Famous G-E No. 1799 varnished cambric and double-asbestos insulation make Deltabeston suitable for operation at high temperature. That's why *at normal ambient temperatures* it can handle more current than ordinary types.

Before you wire or re-wire, check Deltabeston AVA cable. For information get in touch with your local G-E Construction Materials distributor, or write Section W24-425, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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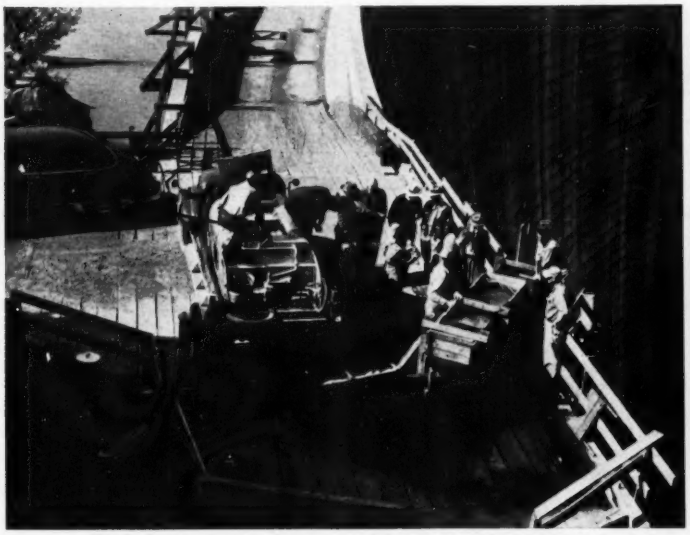
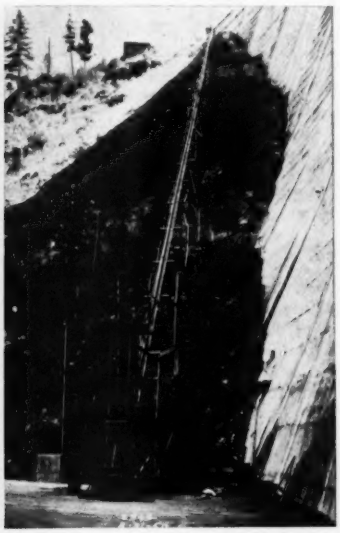
GENERAL ELECTRIC

APRIL 1952 Vol. 108, No. 4

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED SECTION OF THE U. S.





Introducing fingerlings into pilot facilities at Alder Dam (left). Collection chamber (right) subjects fish to static head of 250 ft

Fish and Power Can Live Together

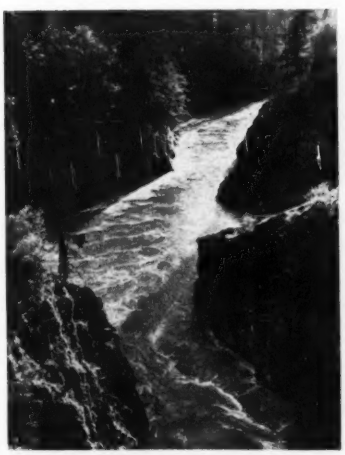
J. Frank Ward

Superintendent, Light Division
Tacoma City Light

On Nov. 29, 1951, the Federal Power Commission issued its opinion No. 221 on the City of Tacoma's application for license to construct two dams and power-generating facilities on the Cowlitz River in Lewis County, Wash.

While the city has always maintained its intention to develop the stream with full consideration to conservation of the fisheries value of the river, the proposal to construct dams and reservoirs on the stream has met with continual and persistent objection from the Fisheries and Game Departments of the State of Washington and sportsmen of the state as well.

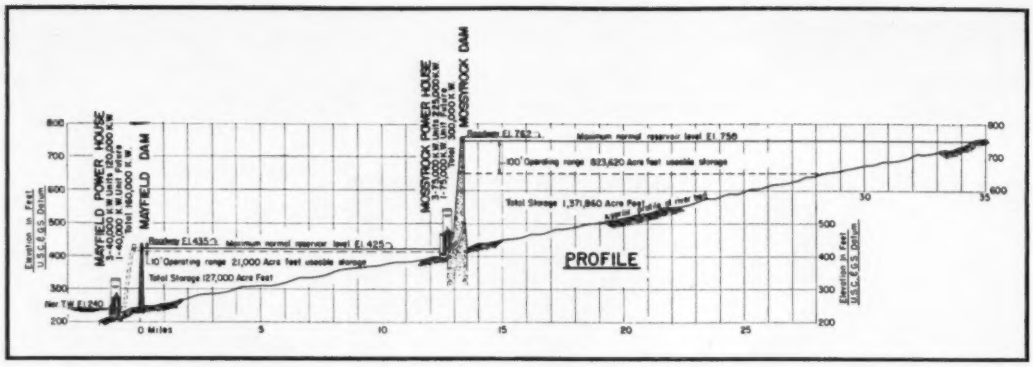
The proposals of the city with regard to handling upstream and downstream migration of anadromous fish have been fully described and discussed during the hearings of November 1950 and January 1951 in Washington, D. C., and in Tacoma, Wash., before the Federal Power Commission. The city council of Tacoma accepted the license by formal action late in December and the effective date of the license was made Jan. 1, 1952. The city council also adopted a plan and system ordinance Jan. 9, 1952, authorizing the issuance of revenue bonds and the construction of the development.



Looking downstream at Mayfield Dam site

In the meantime, however, the Washington State Fisheries and Game Departments asked for a rehearing by the Federal Power Commission, which the commission denied on Jan. 22, 1952. Following this, the state has made an appeal to the United States Ninth Circuit Court of Appeals. This action was filed March 14, 1952.

Under Washington State law, which provides for the securing of a declaratory judgment passing upon



Profile of City of Tacoma's Cowlitz River development. Two plants with capacity of 460,000 kw will utilize a total head of 510 ft

the validity of bond issues by municipalities, the City of Tacoma entered suit Feb. 15, 1952, in Pierce County, Superior Court, against the Departments of Fisheries and Game of the state and taxpayers whom the court appointed to set this legal procedure in motion. The case has been transferred to Thurston County Superior Court at Olympia, which is the state capital, and developments in this action are expected at almost any time.

Both courses of legal action, that in the state courts and that in the federal courts, will be followed to conclusion as rapidly as possible. No action in the field has been taken by the city looking toward construction, although drawings for general contracts for each of the dams are well along toward completion.

Specifications for the turbines and generators are at present in the hands of manufacturers for study prior to the issuance of a bid call by the city. Other heavy electrical equipment, which must be secured, will also be placed on bid call as soon as legal obstacles are cleared away so that such action can be taken.

Description of Project

This development will have a total installed capacity of 460,000 kw although the license was requested for an installation of 345,000 kw. The upper or Mossyrock reservoir provides a usable storage of 823,620 acre-ft and a total storage of 1,371,630 acre-ft. Tailwater at Mossyrock elevation will be 425 ft and reservoir elevation normally will be 750 ft with a maximum drawdown of 100 ft. Mossyrock Dam is to be a gravity arch dam with a crest length of approximately 1,600 ft and a height from bedrock of approximately 525 ft. The extreme height above bedrock is because of the fact that the preglacial stream bed of the Cowlitz River and the present stream bed occupy the same location and the preglacial gorge is filled with drift. The power installation at Mossyrock will consist of four 75,000-kw units. The reservoir will extend upstream for some 21 miles from the dam, which is located about two miles north and east of the town of Mossyrock.

The lower dam, at a point about one mile downstream from the town of Mayfield, provides a reregulating reservoir. The dam itself consists of an arch section in the narrow rock gorge flanked on the west side by a gravity section at high level on the bank above the gorge and on the south and east side of the stream by a five-gated spillway section. The reservoir will have a length of 13½ miles extending to the foot of the Mossyrock Dam and will back water up into the lower part of the Tilton River, which is the main tributary between Mossyrock and Mayfield. At Mayfield the power house is to be built separately from the dam and will be 1,000 ft downstream, being served by a high level intake tunnel of approximately 37 ft diameter and some 700 ft in length. The intake tunnel will end in a forebay with short penstocks to the power house below. Installed capacity at Mayfield will be 160,000 kw consisting of four units of 40,000 kw each. Tailwater elevation will be 240 ft and maximum normal reservoir level will be at elevation 425 ft. The Mayfield reservoir will have only a small fluctuation because of the variation of operation of the Mossyrock power house to obtain maximum output over peak hours of the day.

One of the requirements of the license is that the minimum flow at Mayfield must be maintained at 2,000 cfs for the benefit of downstream navigation. Another requirement is that there must be a retained flood storage of 260,000 acre-ft below normal full reservoir elevation at Mossyrock during the flood season from the first of October to the first of May. Drawdown for flood storage must begin on Oct. 1, to reach maximum on Dec. 1, and must be maintained until Feb. 1, reaching refill stage by May 1. The flood storage provided for would be sufficient to reduce the flood storage at Castle Rock because of the flood of record from 140,000 cfs to 70,000 cfs and bankfull capacity. This would reduce the flood water at Castle Rock from the maximum of 31.6 ft in 1933 to normal bankfull capacity at approximately 22.2 ft.

Speedy Construction

With present day delivery of electrical equipment and under present conditions in the construction field, it should be possible to complete the Mossyrock Dam in between two and three years, and to complete the Mayfield Dam in much shorter time. In fact, the generation of first power can be obtained at the Mayfield site within the minimum time of two years after the start of construction. This is because of the fact that the power house and dam are separate structures and also because of the physical characteristics of the Mayfield Dam site. The major part of the field drilling required at both sites has been completed and basic surveys also were completed early in 1949, since which time no work has been carried on in the field. Diversion tunnels will be required at both sites. At Mayfield the diversion tunnel will be 20 ft in diameter and some 500 to 600 ft in length. At Mossyrock two 32-ft-diameter parallel tunnels of approximately 1,600 ft in length will be used. At Mayfield

TABULATION OF SIGNIFICANT DATA
COWLITZ POWER DEVELOPMENT

	Mayfield	Mossyrock
Drainage area	1,400 sq miles	1,170 sq miles
Annual daily mean flow	5,680 cfs	4,900 cfs
Maximum recorded flow	.....	81,000 cfs
Reservoir elevation—max. normal	425	750
Reservoir elevation—minimum	415	650
Length of spillway, clear opening	205 ft	205 ft
Spillway gates	5-40 ft x 41 ft Taintor	5-40 ft x 41 ft Taintor
Spillway valves	.....	.....
River outlet valve	1-72 in.	none
Reservoir areas		
Length along river	13½ miles	21 miles
Normal	2,200 acres	10,188 acres
At maximum drawdown	1,950 acres	6,190 acres
Reservoir volumes		
Dead storage	106,000 acre-ft	548,240 acre-ft
Usable storage	21,000 acre-ft	823,620 acre-ft
Total	127,000 acre-ft	1,371,860 acre-ft
Flood prevention storage (Max. during Jan.-Feb.)	.....	260,000 acre-ft
Tailwater elev. at plant Capacity (10,000 cfs)	240	425
Installed capacity		
Initially 3 units each plant	120,000 kw	225,000 kw
Future—4th units each plant	40,000 kw	75,000 kw
Ultimate total capacity	160,000 kw	300,000 kw
Energy output—combined plants Estimated average output for operation with present Tacoma City Light system based on 39 years of stream flow records	.....	1,382,000,000 kwh

	Mayfield	Mossyrock
Power house	Concrete substructure and superstructure	Concrete substructure and superstructure
Turbines	55,000 hp each	103,000 hp each
Speed	128.6 rpm	128.6 rpm
Generators	40,000 kw each	75,000 kw each
Dam		
Type—concrete arch, gravity wings and thrust blocks		Concrete—gravity arch
Height—normal tailrace to normal reservoir surface	185 ft	325 ft
Approx. length, over-all	850 ft	1,300 ft
Foundation	Basalt rock	Basalt rock
Substation	Outdoor type—230-kv steel framework substation with two 230-kv lines	Outdoor type—230-kv steel framework substation with two 230-kv lines
Transmission	230-kv line to Tacoma from Mayfield plant	230-kv line to Tacoma from Mossyrock plant
Length of transmission line—Approx. 58 miles		

there is practically no stream bed excavation involved while at Mossyrock extensive cofferdams must be built to protect the excavations below stream bed of some 175 ft to bedrock in the preglacial channel.

Bids for construction at the two dams will probably be called separately, with a single power house contract at Mayfield since the power house at Mossyrock will be built integrally with the dam. The final subdivision of contracts that must be made will depend upon when construction will start and status of financing at that time. The total amount of revenue bond issue authorized by the city is $146 million and the project cost is divided between Mossyrock at a cost of $90.5 million and Mayfield at $33.4 million.

The transmission line from Mossyrock to Tacoma is estimated at $10.1 million and fish facilities have been included at an estimated cost of $7.1 million. A total of $4.9 million has been allowed for fourth units at Mossyrock and Mayfield and some contingencies. Power will be transmitted to the city of Tacoma at 230 kv over a double-circuit steel-tower line approximately 58 miles in length and will be received at the city's new Cowlitz substation where an interconnection with the Bonneville system will also exist.

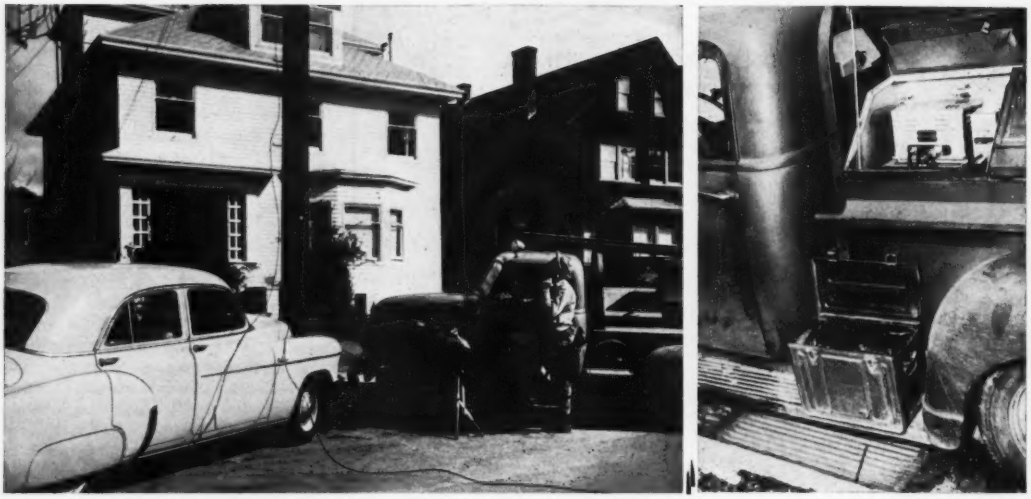
The project will produce 1 billion 400 million kwh in an average and regional minimum water year. Since this project is on the west slope of the Cascade Mountains its power output will be of extreme value to all the Northwest interconnected pool systems as it will insure west side power generation important to the Puget Sound and Portland areas in the event of pool disturbances.

The transmission line losses for power brought into the area from Columbia River plants of the federal government to several Puget Sound communities will be greatly reduced. The cities of Seattle and Tacoma have operated since 1923 in such a way as to develop maximum utilization of their water resources for common benefit. The Cowlitz development capacity has been chosen to increase the benefit from such coordinated operation. The coordinated operation of the cities' systems with the system of the Bonneville Power Administration will be benefited by the generation on the west slope of the Cascade Mountains resulting from increases in Seattle's Skagit development and by Tacoma's Cowlitz development.

Research on Fish Problem

One of the requirements of the license is that no fish facilities may be constructed until their efficacy has been demonstrated. The city is required to cooperate with the Department of Interior and with the Washington State Departments of Fisheries and Game to develop facilities that will meet the requirements of handling upstream and downstream migrations past these dams. Secretary of the Interior Oscar L. Chapman has advised the city that such cooperation will be assured from the United States Fish and Wildlife Service. The cooperation of the two departments of the state has been postponed by them until they learn the outcome of their legal efforts to obstruct construction of the development.

Proposals by the City of Tacoma to deal with these fish problems have produced comment from recognized fish experts other than those employed by the city, to the effect that research and study should be carried on to determine whether proposed facilities will work, or to make them work. Solution of the most difficult problem of handling downstream migration of fingerlings would do much to relieve the long-continued conflict between those interested in the development of hydro resources of the Northwest and those who oppose such development on the ground that fisheries will be immeasurably damaged.



Mobile radio gets quick action when a car hits a pole and wires are down (left). Location of transmitter-receiver is shown at right

Mobile Radio Pays Out in Nine Months

Net savings of $1,500 per set per year are shown by PG and E survey covering 291 mobile radio transmitter-receiver units

R. H. Miller

General Superintendent of Communications
Pacific Gas and Electric Co.
San Francisco

Mobile radio systems have become an indispensable tool in the operation of power systems. Their worth in emergency operations has been proved on many occasions where the use of radio has aided in the saving of life and property. It was for such emergency operations that mobile radio services for power utilities were originally authorized by the Federal Communications Commission. For some time the use of such radio equipment was restricted to communications of an emergency nature. After World War II, the FCC rules were relaxed to permit the use of radio for communications necessary in normal operations as well as for the already authorized emergency uses. While emergency communication is still the primary purpose for mobile radio systems in the Power Radio Service, as defined in Part II of the FCC rules governing Industrial Radio Services, the use of radio communications in normal operations has made it possible to effect economies in operating and construction.

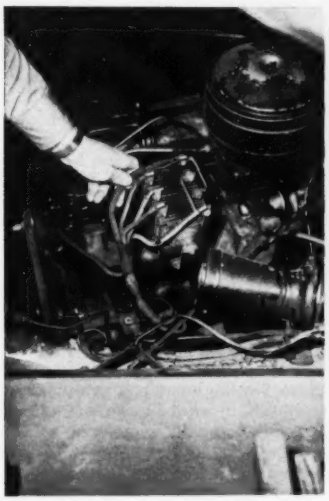
To determine the savings that can be attributed to the use of radio in normal operations on the Pacific Gas and Electric Co. system, a study has been completed covering all divisions of the company. In conducting this study the intangibles, such as improved public relations, were not considered. It was attempted to evaluate only those factors where definite savings could be shown. Questionnaires were submitted to the company divisions requesting information under the following headings:

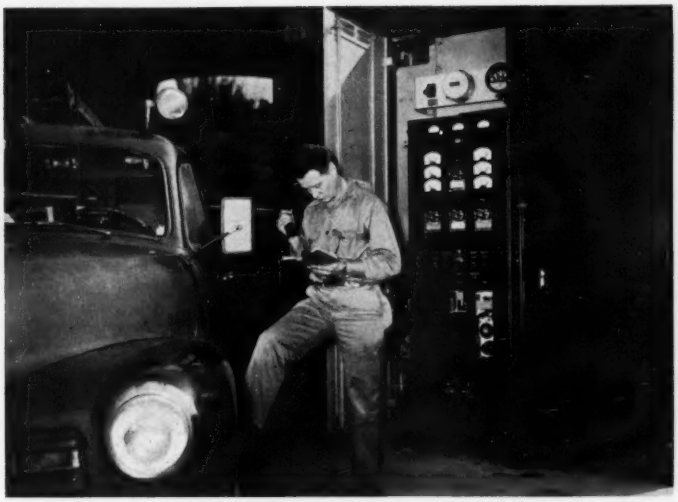
1. Reduction in personnel.
2. Deferment of hiring personnel.
3. Reduction in cost of handling trouble tags.
4. Reduction in loss of revenue because of reduced outage times.
5. Reduction in cost of restoration of service.
6. Reduction in cost of repairs and construction.

It was also requested that any other factors that could be evaluated be included in the division reports. Segregation was made between electric and gas operations and the results of the survey are summarized in the accompanying tabulation.

There were 291 mobile radio transmitter-receiver units involved in the study, covering all of the area of company operation and also including construction activities such as wire stringing and major gas line construction. The largest item of saving in most cases was reduction in cost of handling trouble tags. This item is probably the easiest to evaluate by comparison with records maintained before and after the installation of the radio equipment. Other items, such as reduction in loss of revenue, were evaluated by analyzing specific cases of trouble and by determining from records average number of similar cases per year.

From these data the annual dollar saving was then calculated. In all cases it was attempted to stay on the conservative side in the reported savings. Unusual situations, where there was little chance of recurrence, were not included in the reports. The total savings in each division were used to determine the average annual saving per mobile set per year for each division and on a system-wide basis.





Heavy duty a-c generator and rectifier (left). At right, service man receives switching instruction at the unit substation via radio

There were wide variations in reported savings from different divisions, with a low of $500 and a high of $4,532 per set per year. After considering the different operating conditions, such as other types of communication available, terrain involved, density of population and types of load served, the variations correlated fairly well. It has also become apparent from this study that some of the radio installations are being used more effectively than others and efforts are being made to improve operating practices in the less effective installations to bring them more into line with those where good operating practices have shown their worth in providing greater annual savings.

$1,500 per Year Net Saving

Considering the over-all results, the average annual savings are as follows:

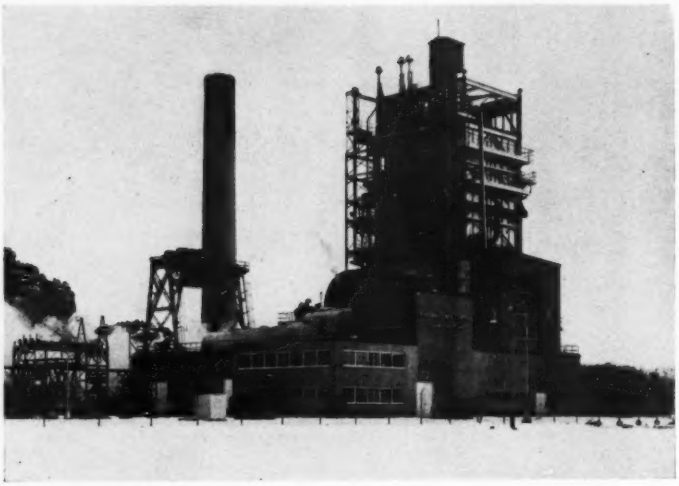
Operation	Saving per Set per Year
Electric operation	$1,679
Gas operation	727
Line construction (electric)	2,658
Gas construction	4,470
Over-all weighted average	1,595

The figures given in the tabulation do not consider the cost of maintenance of radio equipment, which should be included in order to determine net savings. Maintenance costs vary in different locations with the number of sets involved, travel required, etc.

Information on the cost of maintenance of mobile radio equipment is being collected and appears to vary from about $75 to $150 per set per year, with an average of approximately $100 per set per year. With the maintenance included, the average annual net saving per set indicated by this study is approximately $1,500. The cost of a 2-way mobile installation, including the set, selective calling unit, heavy battery, heavy generator and overhead, is a little less than $1,000. *Taking a cost of an even $1,000, it means that mobile radio pays for itself in the surprisingly short time of nine months.*

It is apparent from the results of the study that, in addition to fulfilling the primary mission of saving of life and property in emergencies, mobile radio systems can and do pay their way economically in day-to-day operation of power utilities.

Mobile radio effects large savings in connection with the operating of pole top switches



Bird plant showing outdoor turbine-generator, outdoor boiler with enclosed firing aisles

Bird Steam Plant Built for $87 per Kw

A. B. Martin
Chief Engineer, Montana Power Co.
Butte, Mont.

Planned as an outdoor plant to give low-cost firming capacity to an otherwise all-hydro system, the Frank W. Bird steam-electric station of the Montana Power Co. at Billings has been successfully operated through its first winter with ambient temperatures as low as –30 F. The plant is the first steam addition to a generating system that previously consisted of 12 hydro plants with capacity of 400,000 kw.

The strictly firming functions of this plant will result in a long-range load factor of less than 30%, because the firm generating capacity of the company is based on critical river flow conditions. Moreover, there will be little need for steam power during the low peak load, high-water run-off months of April, May and June. However, in low-water years the Bird plant will be called upon to deliver its full capacity for seven to nine months out of the year.

In order for a steam power plant to fit economically into this picture, it is necessary that it have the benefit of low fixed charges as well as low fuel and operating costs. The new plant was designed accordingly. Its completed cost, including land, switchyard and step-up transformer, on the basis of 66,000 kw, is approximately $87 per kw.

Ideal Site

The Billings location was chosen because it is a growing load center in the eastern end of the Montana Power Co. service area, approximately 200 miles from the nearest large hydro production. Fuel oil, natural gas and lignite coal fuels are, or can be made, available at low cost. The Yellowstone River provides an excellent source of cooling water.

A 60/66,000-kw preferred standard unit, operating at 850 psi and 900 F, was chosen as the most economical for the expected operating conditions. A more efficient design using higher pressure or reheat cycle, with consequent higher first cost, could not be justified because of the expected low load factor and low fuel costs.

In an emergency, local loads can be supplied by existing transmission lines from hydro generating plants. Hence, a high degree of continuity at the Bird plant is not essential. Consequently, investment savings were realized through the adoption of single-unit outdoor construction and the elimination of much stand-by auxiliary equipment. The forced draft and induced draft fans are each single, uniform-speed units, being regulated by vanes and dampers. Condenser cooling water is circulated by a single vertical pump on the bank of the Yellowstone River, approximately 200 ft from the plant. Cooling water temperatures vary from 32° in winter to a maximum of 68° in summer. Recirculation of discharge water is regulated to prevent formation of needle ice on the screens.

The site selected just south of Billings possesses other natural advantages. Foundation conditions were excellent and only a four-foot mat was required under the turbine pedestal. Construction materials and labor were in good supply from local sources.

Steam Generator

The steam generator is a Foster-Wheeler, outdoor, single-drum, extended-surface type with capacity of 675,000 lb per hour at 920 psig and 905 F. Enclosures or antifreeze protection against ambient temperatures as low as –40 F are provided for all exposed piping; firing aisle and steam drum ends have walk-in shelters; and the headers, valves and connections at the rear of the boiler are protected. External control and drain lines are enclosed in insulated sheet metal pipeways. Intermittently operated steam lines, such as soot blowing lines, are protected by insulation and resistance heaters.

Except for some minor increases required in the amount of electrical heating, these weatherproofing methods have given satisfactory operation during the past winter. Boiler operating levels are served by an automatic elevator operating in an enclosed shaft.

The boiler is elevated to provide for future coal firing but otherwise equipped only to burn oil and natural gas. Burners are of combination steam atomizing oil and natural gas design. Fuel oil with a maximum viscosity of 300 SSF is the primary fuel at the present time. Billings fuel oils contain approximately 3.5% sulphur and up to .07% vanadium. Considerable slagging was predicted because of this unusually high vanadium content but, in

the first five months of operation, it has not been apparent.

Fuel oil is transported by a 5,000-ft 6-in., insulated, overhead pipeline from a nearby oil refinery. This line is supported on wood pole stanchions and is electrically heated for the last 3,400 ft. Power for heating is supplied at 110 v, a-c, from two 2,400/110-v transformers, approximately 1,600 ft apart. Loading on each transformer is approximately 100 kw for three hours to bring the cold line up to a minimum pumping temperature of 180 F. Fuel oil storage consists of one 80,000 bbl welded-steel tank and one 5,000 bbl day tank.

Turbine Generator

The turbine-generator is of General Electric manufacture and is mounted outdoors, as shown, on a pedestal 20 ft above ground line. The generator is hydrogen cooled, 13.8 kv, 3-phase, 60 cycles, rated at 60/66,000 kw at .85 power factor.

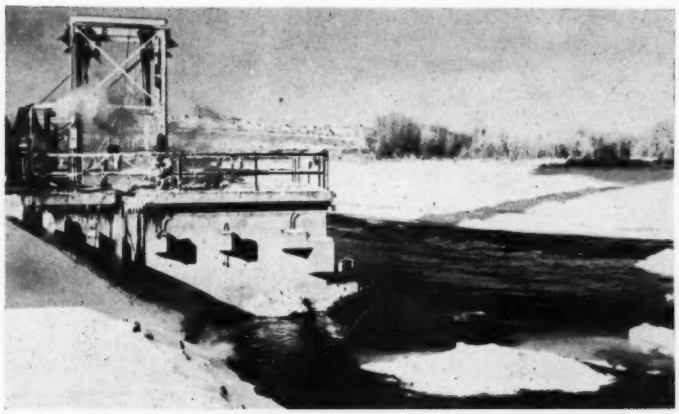
The generator leads are isolated phase to the outside of an enclosure below the pedestal, thence by open bus to an oil circuit breaker and 82,500-kva, 13.8/110-kv, 3-phase transformer. A two-mile 110-kv transmission line delivers the power to the main Billings area switching yard.

Walk-in housings are provided at the governor end of the turbine and over the exciter. A 30-ton gantry crane is mounted on the turbine-generator floor. The control room is located at the turbine level over the auxiliary bay near the turbine end of the unit.

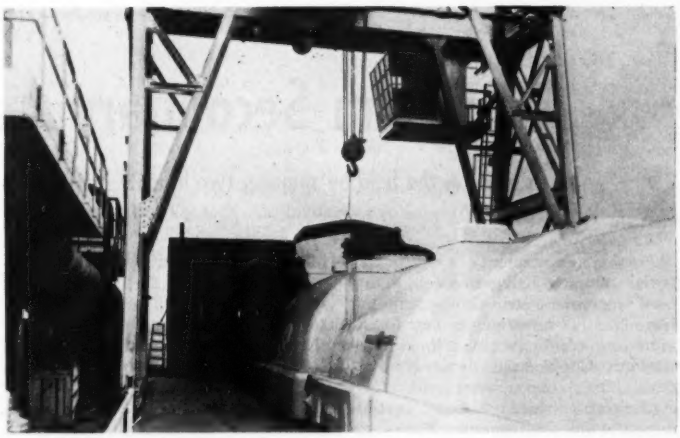
A combination electrical and mechanical control board is located in the control room using miniature instruments arranged in a mimic flow pattern. An additional supervisory control panel is also located in this room for the remote observation and operation of distribution substations in the Billings area.

The plant is operated by a shift foreman, control room operator, fireman and auxiliary operator on each eight-hour shift. On the day shift, there are eight additional men, including superintendent, engineers, machinists, electricians, clerk and laborers. This is a total of 24 men on the basis of a 42-hour work week. The plant and work are so arranged that operators are outdoors for only short periods of time during stormy weather.

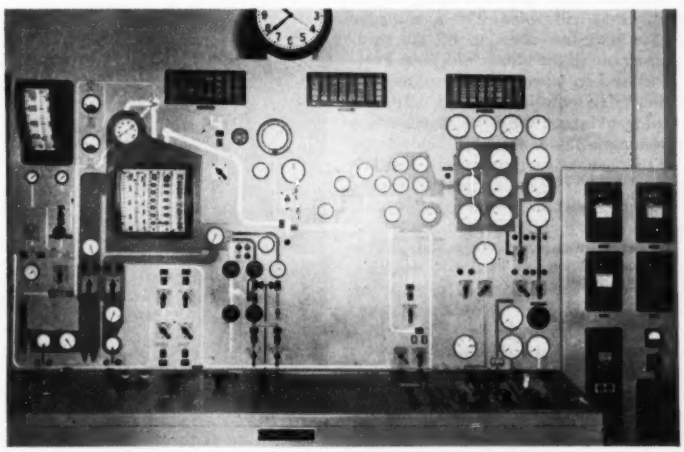
The Frank W. Bird station was designed under the supervision of H. H. Cochrane, consulting engineer for the Montana Power Co., by Ebasco Services Inc.



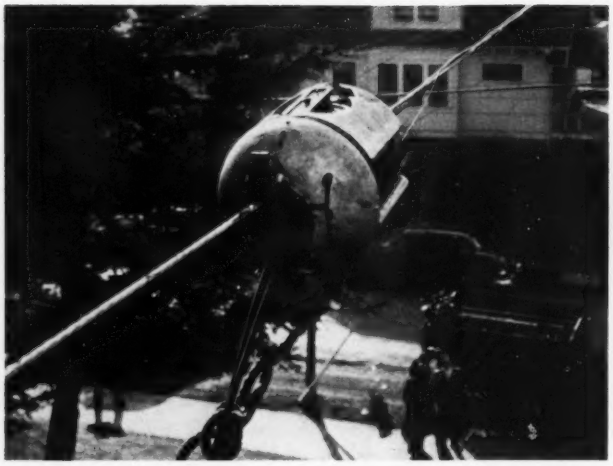
Circulating water intake showing severe conditions under which it operated this winter

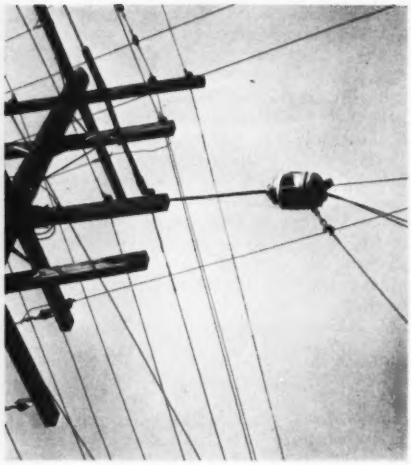


Walk-in housings are provided over governor and exciter ends of 66-mw outdoor unit



Boiler turbine generator board. Operators are outdoors for only short periods of time





Cable spinner is spinning two No. 2 neoprene-insulated all-aluminum conductors onto ⅜-in. high-strength Copperweld messenger

Aluminum Secondary Aerial Cable

. . . is made in the field by spinning two insulated conductors on Copperweld messenger

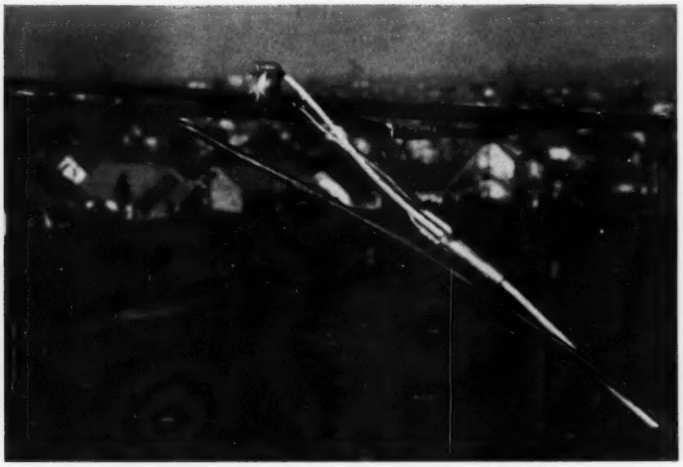
Further experiment in secondary aerial cables is being made by Portland General Electric Co. by spinning two No. 2 neoprene-insulated all-aluminum conductors on a ⅜-in. high-strength Copperweld messenger-neutral. This latest experiment is an evolutionary (third) attempt to produce the most satisfactory aluminum conductor aerial cable for use in place of open-wire secondaries. The whole objective is a self-supporting aerial cable that will permit 250-ft or longer spans and the omission of the mid-block pole in the 200-ft blocks in Portland and to permit longer spans elsewhere. To eliminate a pole effects a saving of about $100—a worth-while economy. Moreover, with ridge pin primary construction and secondary aerial cable, the appearance of a pole lead is greatly improved. The accompanying staff photographs show the spinning of this latest cable. The spinner used was a model K machine made by Cable Spinning Co. of Topeka, Kan.

Method of Spinning

Two sheaves pick up the two aluminum conductors off the ground as shown and guide them parallel and in triangular configuration with the Copperweld messenger. The spinner has two bobbins that normally produce one turn of the steel spinning wire every 6½ in. However, in order to permit the aluminum conductor in the spun cable to be easily separated for making service drop connections, only one bobbin was loaded with the spinning wire. This made one revolution of the spinning wire in 13 in. instead of two. The spinning machine was drawn along with hand lines from the ground, and it took about five minutes to spin a 250-ft span.

As stated, this was purely an experiment, but it turned out very well. Superintendent of Distribution A. B. Cayo and his assistants, A. D. Fragall and E. A. Paine, wished to assure themselves that a satisfactory aerial cable could be made in this manner. Concern was felt about how tight and compact such a cable would be. It

Aerial cable using triplex aluminum conductors spun onto high-strength steel messenger



Using an Industrial Monkey (left) to make service tap. At right is shown make-up detail of tapping triplex service to aerial cable

was feared that the two aluminum conductors would not lay snugly to the messenger and that there might be loose spots where the wind would cause vibration and cutting of the steel lashing wire into the neoprene insulation.

Successful Mechanically

A careful examination of the cable in mid-span from an Industrial Monkey revealed a beautiful job of spinning. The aluminum wires laid snugly and taut in perfect configuration below the messenger.

No trouble at all was experienced in making mid-span service taps with No. 4 all-aluminum triplex service cable. A Fargo SDE4 automatic dead end with a flexible bail was used to anchor the bare neutral of the triplex service wire to the messenger. The neutral electrical connection was made with a single-bolt parallel-groove clamp plated for use on copper or aluminum. Connections to the hot legs were made with a 1½-in. section cut from a split aluminum repair sleeve, using the Nicopress tool.

Field spinning made compact aerial cable

Life Is a Question

The only remaining question about this type of aerial cable is how well and how long the 3/64 neoprene insulation will stand up. Only time will tell that, but from known properties of neoprene a life of 30 years or longer is expected.

Previous Experiments

PGE engineers have been experimenting with aerial secondary cable for more than a year. The first (ELECTRICAL WEST, May 1951, p 72) was made by clamping a triplex aluminum cable to a high-strength steel messenger. The next step with materials available was to use triplex aluminum cable spun on a high-strength steel messenger. This third step incorporates the Copperweld messenger. It is their hope to obtain soon an ACSR cable with sufficient steel for strength and only enough aluminum strands for neutral conductivity. Such a messenger cable has been promised.

Incidental Problem

One incidental problem is how to tap off triplex services without getting a zigzag cable from side pressure of a ladder leaning against the cable with a man on it. An Industrial Monkey, as shown, would of course solve this problem, but it is too expensive a piece of equipment to use for making occasional services. Every connect crew should be able to install services.

Extension Ladder Will Be Used

This problem will easily be solved by bolting strap-iron horns, as it were, on the projecting top side members of an extension ladder. These horns will have facing J hooks offset so that when the ladder is raised straight up beneath the cable, and at right angles to it, the hooks with a slight twist of the ladder will automatically grasp the cable as the ladder is allowed to incline longitudinally with the cable. The lineman climbs the ladder and puts his safety around the cable and is in safe and secure position to make the service connection.

The strap-iron hangers will be bolted onto the wooden side members of the ladder so that they may easily be removed for normal use of the ladder. In that way all connect crews and emergency crews will be able to work on these aerial cables by providing them with a set of the hangers.

Investigation into new low-cost methods of line construction will be continued by Portland General Electric Co. Its distribution engineers already feel that they are on the trail of some real economies, besides greatly improving or streamlining the appearance of both urban and rural distribution lines, in addition to cooperating with the government's copper conservation program.

Portable batching operation. Loader at left picks up and delivers aggregate to conveyor belt at right where cement is added

Portable Transit-Mix Batching Centers

. . . found most economical method of providing concrete for tower footings on 260-mile 230-kv Owens Gorge transmission line

J. F. Mariscal

Engineer of Construction
Los Angeles Department of Water & Power

In the recent construction of the Los Angeles Department of Water & Power 260-mile 230-kv Owens Gorge transmission line over rugged mountain and desert terrain, there were a number of problems to be considered. The procurement of screened aggregate for concrete tower footings was described in the September 1951 issue of ELECTRICAL WEST. The mixing and long-distance transportation of concrete to tower sites for the most economic construction were other problems confronting the construction forces.

The length of the Owens Gorge transmission line was approximately the same as the 287.5-kv Hoover Dam lines; however, there is a difference in voltage. Structural design and fabrication were quite similar; therefore, every opportunity was taken to capitalize on the construction experience of the Hoover Dam transmission lines.

Past practice of transporting and dumping sufficient coarse aggregate of various sizes at each tower site and the delivery of the required amount of cement and water for mixing at the tower site had been found to be unsatisfactory. Such quantities were found to be either deficient or in excess for various reasons whenever the footings were poured. Several other construction alternatives were considered. However, the one that gave the greatest economy in hauling aggregate, cement and water was finally decided on.

Portable Batching Centers

This construction procedure consisted of establishing portable batching centers along the transmission line at the most economic points. These were usually at intervals of about eight miles where aggregate and water would be available without much difficulty. The aggregate required consisted of 1½-in. and ¾-in. rock and sand. Sand was delivered from the department's aggregate screening plant working along the transmission right-of-way; the cement was delivered directly to the batching centers from various cement plants.

In order to get the most economic construction and meet specification requirements, accurate proportioning of aggregate was required. Therefore, the batching was performed by weighing the proper amounts of the screened aggregate before mixing. Considerable time was spent seeking equipment that would fulfill requirements and it was finally found in the Willard combination loader and batcher. This combination loader and batcher is fabricated locally by the Willard Concrete Machinery Co. of Los Angeles. Upon first inspection it appeared to have all the requirements necessary.

One unit was purchased and throughout the job this piece of equipment performed excellently and beyond expectations. The unit was found to be more than capable of keeping four 3-yd transit-mix trucks loaded and busy. The batcher, operated by one man, moved under its own motive power from one stock pile to another, loading and weighing proper amounts of aggregate of each size. The batcher then moved over to the conveyor belt and unloaded the batch through the bottom of the hopper onto the conveyor belt. The sacks of cement were dumped either into the hopper from a trailer or directly onto the conveyor belt and into the charging hopper of the transit-mix trucks.

Mixing and transportation of the concrete batch were performed by a

Transit-mix truck delivers concrete mix directly to tower location for pouring footings

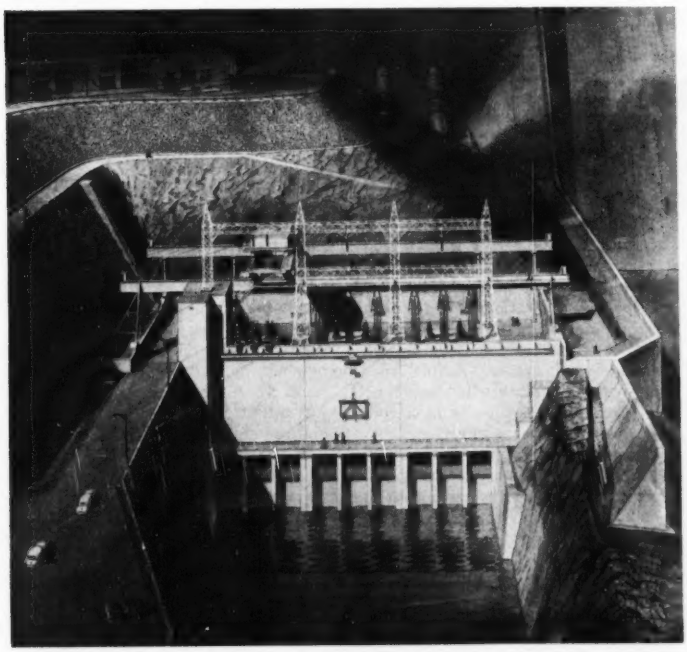
simple but effective transit-mix unit mounted on department truck chassis. Here again, investigation revealed that the ordinary transit-mix trucks would cost as high as $10,000 and would not be designed or constructed for the ruggedness necessary to travel over rough mountain and desert construction roads. The department was fortunate in having previously purchased some war surplus 6x6 3-axle drive trucks. The extra power and tractive effort afforded in these trucks were found to be needed in crossing mountain roads and desert sands.

The Willard 3-cu-yd transit-mix equipped with water tank, power take-off and water meter cost about one-third of the standard transit-mix unit. However, the other features of ruggedness, simplicity and ease of operation demonstrated the equipment to be ideal. It must be emphasized that the extra motive power of the trucks more than paid for itself.

Of the 1,274 steel towers in the 260 miles, all but about 100 towers were poured directly from transit-mix trucks. Mobility of all of the equipment permitted the pouring of a maximum of 12 towers in one day, corresponding to approximately 90 cu yd of concrete.

First Use of Technique

This particular equipment and construction technique, to the best of the department's information, has never been used before on such a long transmission line. Results obtained on the Owens Gorge transmission line using the portable batching centers, however, more than proved its worth and permitted the erection of all of the steel towers, even through the rugged country, in record time.



Artist's view of Folsom Dam and power house. The plant will have three 54,000-kw units

Folsom Power House Construction to Start

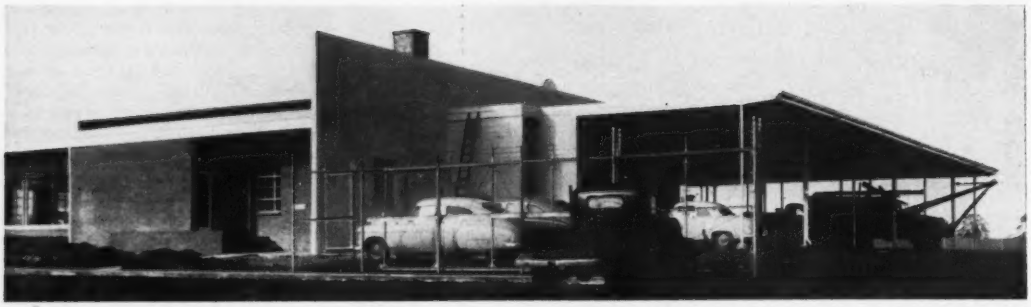
Construction on Folsom power house on the American River 25 miles northeast of Sacramento, Calif., is to begin soon after opening of bids on April 2. The plant will contain three 54,000-kw generators driven by 74,000-hp hydraulic turbines. First unit is scheduled for completion in June 1954.

Folsom power plant together with Folsom Dam, which is now under construction by Army Corps of Engineers, is to be operated by the Bureau of Reclamation and integrated with the bureau's California Central Valley system. Annual output of the plant is placed at 240 million kwh.

The main building, of semiunderground type, will be of reinforced concrete, 96 ft wide, 228 ft long, and 111 ft in height. Its roof deck will be approximately the present level of the stream surface. The power plant is being built below ground to utilize completely the full fall of water from Folsom reservoir.

Three steel penstocks, each 15.5 ft in diameter and 200 ft long, will be placed in tunnels 200 ft long from the intake.

A five-mile wood pole 69-kv transmission line will be built from the Folsom plant to a switchyard at Nimbus Dam from where power will be fed into the Bureau of Reclamation's Central Valley system.



Loading platform at new service center is completely covered. Separate garage building provides parking and maintenance facilities

Offices for division superintendent and general line foreman (left). At right is shown the high-ceilinged well-illuminated storeroom

Modern Service Center Displaces Basement Storeroom

Many improvements in operating efficiency have been made possible by a new service center for the Oregon City division of Portland General Electric Co. The new facilities, as shown, rectified a situation that exists with many of the smaller utilities and in some divisions of the larger companies—that of having materials stored in a back room or the basement of a downtown office building. At Oregon City the storeroom was in such a basement; transformers, crossarms and poles were stored in a yard half a mile away. Line trucks were parked in an adjoining lot. Each night, the truck drivers had to unload and reload the trucks under these adverse conditions. This work was done on overtime with resulting high costs.

New Facilities

The new service center is situated on a fenced six-acre tract at the southeast edge of the city; is conveniently located in relation to the large area served by the division, and is laid out with a view to obtaining maximum efficiency in electric utility operation.

The main two-story building houses offices and quarters for the division's line department and has a large storeroom. About 7,000 sq ft of floor space is provided in the building. At the front on the ground floor are offices for the division superintendent and general line foreman, with space adjacent for the work dispatcher and the switchboard operator. Ample space was provided for a kitchen and lunch room for office employees in a room adjacent to the main office.

On a partial second floor of the building are the locker and shower rooms for the line crews, which at the present time number 25 men. These quarters are modern in every respect.

Storeroom

The rear portion of the building is occupied by the storeroom, which has a floor level at the same height as the loading platform on the exterior of the building. The large high-ceilinged well-illuminated storeroom has two small offices conveniently adjoining the loading platform for storeroom personnel, and a large overhead door for access to the loading platform. Built on one side and the rear of the building, the loading platform is completely covered by a roof that slopes out far enough to provide weather protection for trucks parked at the platform. A fork lift truck in the storeroom effects large savings. Under the new situation, the material is right at hand when the truck pulls in and it is just a matter of a few minutes to load and unload.

A separate steel garage building 182x40 ft, located on the service center site, provides parking and maintenance facilities for all the division's vehicles. At present this building houses the light automotive equipment.

The service center layout was planned to provide for future expansion and was designed by John Schneider, architect with Burns, Bear, McNeil and Schneider of Portland. According to D. D. Curts, division manager, the new service center design has made possible many improvements in operating efficiency.

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Building hesitates

Construction sagged badly during January and February but showed signs of life in March as weather improved and also as NPA, finding its early estimates of metal shortages to be wrong, relaxed to permit more school, public building, then commercial construction. The military as usual had overordered and started cutting back, the pace of the defense program was slowed down, and inventories of metals began to pile up. In some areas unemployment was getting serious in the construction business, and this being an election year, that couldn't be permitted, at least not in populous centers like Los Angeles, San Francisco, Portland and Seattle. These got some relaxing first.

Firstest with the mostest

San Francisco's electrical journeymen's rate of $3 an hour was authorized by CISC beginning March 17. Oakland's local demands "parity" without protection of previously bid work, retroactive to March 17. Sacramento signed up for $3 beginning May 1. Seattle and Tacoma had asked WSB for a 20c an hour raise from $2.65 and $2.55 respectively. Salt Lake City union and NECA filed asking $2.53 or $2.60 from $2.40; Pocatello $2.50 from $2.36½; Idaho Falls $2.40 from $2.15. Other negotiations have been in progress as well.

In a big rush

If the steel companies hold out for a price boost to pay for the wage and fringe increase there may be a strike. Politics may prevent a showdown, for some steel companies could take a strike because of a softening of business. There is great haste by CIO to get its demands before the drop washes out its cost-of-living reasons. For one thing there seems to be more material than demand in many lines.

Bust or boom?

You can take your pick of economic theories as to business for the rest of 1952. Government economists are on the rose tint side, some of the big business economists are tossing out storm warnings. Our own Mc-Graw-Hill economist, Dexter Keezer, is optimistic, does not "share the jitters about the business outlook" others express in the East.

Seeing's believing

Westinghouse's well-dramatized road show on industrial lighting, called "Lighting at Work," made the circle of the West in March with showings in Salt Lake City, March 10; Spokane, March 13; Portland, March 17; Seattle, March 18; San Francisco, March 24; and Los Angeles, March 27. It was designed for architects, contractors, consulting engineers and utility lighting advisors.

Copper the key

Copper, to hear Washington, is still in critical supply, but actually contractors seem to have enough. In fact some who overloaded are selling to each other to reduce inventory. Some wire manufacturers are even worrying over cancelations of back orders. It may get rough later but right now there's ample for what building there is.

More of it later

Anaconda is starting its long reserved Yerington, Nev., project, which will produce at the rate of 30,000 tons a year by 1953. Its Butte project is yielding added tonnage and soon the Chili operations will bring more. So its chief engineer, L. F. Hinkernell, told the AIEE to be selective in its use of copper and aluminum; to avoid the latter where many problems still exist.

Aluminum's connections

These problems do exist. Electrical West was assured by R. A. Schatzel, vice-president in charge of engineering for Rome Cable Corp. of Rome, N. Y., who with Dwight H. Thayer, advertising manager, was at the PCEA meeting in Fresno, and also visited the new Rome plant in Los Angeles. Those problems are chiefly of making satisfactory connections that will stand up. In wiring devices the increased size needed for carrying capacity makes difficulties . . . Recently the wiring device advisory committee to NPA claimed it would increase their use of copper.

Where it can fit

Although NPA's new M-100 housing order authorizes one pound of aluminum for two of copper, it isn't likely that much small aluminum building wire will be used. It is still too hard to handle and make connections to wiring devices. Where aluminum can be used to advantage is in manufacture, such as General Electric is doing in motor and generator windings, cores, cases, lamp sockets, etc. G-E will free 10 million pounds of copper in its plants by substituting aluminum and other metals.

Releases construction

Construction controls were eased by the revised CMP Reg. 6. The separate housing order M-100, after much argument, still allows 35 lb of copper to wire a house but cuts down on copper plumbing. Where electric heat is installed an added 15 lb is allowed. Small commercial construction under self-authorization was made easier. Up to 200 lb of copper can be used per quarter for a store or commercial building up to a total of 600 lb without applying for an allotment. Contractors with customers previously turned down should have them reapply and chances are better they'll get approval.

A hope

Even decontrol is talked of as the steel supply and aluminum is coming into production. Copper is the only bottleneck. Strikes, though, could throw everything back into tight controls again.

Ready for TV

Community antenna systems for TV have been reclassified for 25 tons of steel, 2,000 lb of copper and 1,000 of aluminum per quarter. The freeze on TV is being lifted this month. Construction permits may be granted during the latter part of this year. Some good jobs there.

Unnecessary?

Price controllers are having a hard time justifying an extension of the controls beyond June in the face of lowering prices and increased competition. Congress wants to know what you think. Tell it.

Special huddle

NECA's president. Don B. Clayton, is calling a special membership meeting at Sheraton Hotel, St. Louis, June 20. The annual convention isn't until Oct. 5. But pressure from some big gypsy contractors for an easier dues deal and complaints from chapters that the big travelers aren't living up to the rules when operating in local chapter areas makes a meeting imperative. Such reasons are not listed in the announcement, which says the matters likely to need action are: promotion of legislation by the mechanical trades to stop bid peddling on government contracts; refusal of federal agencies to recognize association dues; a better plan for construction industry jurisdictional dispute settlements (both NECA and IBEW pulled out of the joint AFL jurisdictional committee); the copper vs aluminum controversy, and the business promotion program for hard-hit areas.

After two evils

Federal Construction Contract Bill (S. 2907), introduced by Senators Kilgore, Sparkman and Ferguson, is what NECA wants passed, and so do the master plumbers and the heating, piping and air conditioning contractors associations. First part of the bill would aim to stop general contractors from gaining experience at public expense by setting up their own electrical departments on cost-plus-fee contracts. The second part is aimed at bid peddling, and would require a general to refund to the government any benefit he chiseled away from a subcontractor.

Compromise proposed

In California attempts to remove the sub-bidder listing requirement from the bidders law on state building resulted in appointment of an interim committee to study the whole question and reconcile the industry. The State Builders Exchange has drawn a proposal to remove the listing of subs but to have all bids go into state-selected bid depositories in banks or trust companies. This is being studied by the electrical contractor associations before giving assent.

Managers exchange

Chapter managers of National Electrical Contractors Assn. chapters from all over the country held their most productive institute in Chicago March 11-13, under the capable chairmanship of W. J. Varley of the San Francisco association. From the West Managers John Majerus, Puget Sound; Bob Wilkinson, Spokane; William Blackmar, Montana; Don Larson, Rocky Mountain; Varley; Ernest Kramm, Northern California; William Welsh, Sacramento Valley; Ed Grogan, San Joaquin County; and Warren Penn, Los Angeles, participated in the strenuous business meeting. About 70 of the 97 chapters were represented.

Feels 'em out

To find hidden outlet boxes and conduit plastered-over walls, Plaster-Eye Co. has a "doodle bug" device that locates the metal in the wall by means of a high-frequency field set up from a self-contained battery and controls. A zero setting also allows balancing out the effect of metal lath.

Welcome assured

Contractors, wholesalers and manufacturers representatives are especially invited to the Business Development Workshop of Pacific Coast Electrical Assn. at Huntington Hotel, Pasadena, April 24-25. Among the discussion groups will be those on commercial and industrial lighting and power applications, residential adequate wiring, planned home lighting, television installation and maintenance, packing house lighting, automatic poultry feeding, school lighting. H. C. Rice, So. Calif. Edison sales manager, is section chairman.

Stabilization in name only

Hold your hats, here comes another round of inflation. The union-created Wage Stabilization Board (to dodge the Taft-Hartley law) beat down its industry members and came out with a new wage formula decorated with fringes. Then the Construction Industry Stabilization Commission went its parent one better to boost the ante in "permissible" increases to a 15c an hour wage boost and up to 7½c an hour in employee contributions to health and welfare benefits. Every local is going to ask for the limit, whether it has men on the bench or not, waiting for civilian work that the public isn't buying at the prices it has to pay.

Started

Albuquerque is planning to establish a chapter of the Illuminating Engineering Society with the aid of the Rocky Mountain Section in Denver. F. A. Dunn has been acting as temporary chairman.

Moved

Richards-Conant, sales engineer representing the Wiegand line in the Denver area, moved to 2415 15th St. on April 1. Was formerly in the Cooper building.

More room

Ward Leonard Electric Co. is expanding into a bigger office with two and a half times as much area in Los Angeles at 1605 E. Olympic Blvd., it was announced by Stanley Eales, district manager. Both light assembly and stock facilities are enlarged as well as office space.

Same here

C. T. Bakeman & Associates "pushed out the walls" at the former location so now have new offices at 445 Bryant St. in San Francisco, and even have some space to rent. Handle the Wakefield, Silvray, Gotham and Wheeler lines of lighting equipment.

Lighter motor

General Electric gave the press a preview of a completely redesigned new and lighter, more compact and electrically improved fractional horsepower motor in March. Known as the Form G motor, while it holds to NEMA dimensions, has nylon liner slots, eliminates all cellulose insulation, operates in any position, has double-end ventilation, improved appearance and saves 40 to 50% in weight—and materials.

Cradle for wire

Anaconda has developed and made available to the industry a new method of packaging magnet wire spools. Similar to one type of lamp carton, the container is molded fiber or pulp into which a number of the spools nest. Makes shipping, carrying, storing much simpler and prevents damage to the spools in transit.

Pertinent nowadays

Thomas & Betts Co. has a bulletin that contractors handling copper and aluminum cables will find useful. It is No. 67, a 32-page one called "T&B Method" of making compression joints for cables. Applications and methods in various fields, such as aircraft, shipbuilding, building construction, etc., are covered.

Surplus source

As a buyer as well as seller of surplus wiring materials, the Surplus Materials Corp. of 3 Railroad Ave., Stryker, Ohio, has issued a new catalog bulletin of the stocks it has available, particularly wire, which may be of interest to contractors who have run against shortages. It is also interested in buying surpluses.

New ideas in street lighting

Seattle, midway in its big street lighting program, is testing out new developments too. It is trying some of the new color-corrected mercury-vapor lamps on a downtown street. It is also testing fluorescent street lighting at a busy suburban intersection. While England has used fluorescent lighting for economy reasons, one city in the East only has tried it for street lighting in the U.S.

Portable power

National Electric Products has a gimmick that meets all the requirements for a portable power rig on construction jobs, maintenance, etc. Using its grounded surface-duct strip on a swivel mount fastened to a steel tubular rack and dolly rig with insulated wheels, it also has a circuit breaker for added safety as well as grounding neoprene cable.

Valuable sessions

Conference and Industrial Electrical Exposition of the Electrical Maintenance Engineers Assn. of So. Calif. was a success and will be told about in detail next issue. It was held at the Veterans Memorial Building in Culver City, which may have cut attendance, but those who came meant business. Attendance at the two-day conference on planned maintenance at $15 per person was 106, considered excellent, with some coming from Arizona and Nevada to it. See next issue for pictures and a review of the conference program.

NECA news

Plans for the annual District 6 meeting of NECA chapters at the Mar Monte Hotel, Santa Barbara, May 9-10 are now being completed by Matt Sherwood, NECA field director, who has just returned from the chapter managers conference with a tour of Colorado, Montana, Idaho and Utah in company with Wm. Blackmar Jr., his assistant and Montana Chapter manager. Montana Chapter now negotiates for 11 of Montana's 17 wage areas and is working on a state line agreement. The District 6 meeting will have one day devoted to association business, the second will hear speakers representing the industry and public. Los Angeles Chapter, under leadership of Warren Penn, is planning to bring a nationally known consultant on insurance and welfare problems to address a construction industry meeting in Los Angeles soon and advise on the policy in respect to the recent WSB granting of such benefits.

Promoting contractors

Sam Rosch, consulting cable engineer at Anaconda Wire & Cable Co., was the "main event" for the quarterly meeting of the Electrical Contractors Division of San Diego Bureau of Home Appliances, March 28, at Balboa Park. Details of the Spring Fair of Modern Home Ideas, in which the division will have a prominent display, were outlined. Radio has been added to the newspapers as media to advertise contractors in the area, contractors were told. As another public relations measure it was the contractors division which sponsored a public meeting at which Alston Rodgers of General Electric Lamp Dept. staged his "Salute to Lighting Progress" in San Diego, March 7, at Roosevelt Jr. High.

Critical

Cobalt, Idaho, as the name implies, is where cobalt—also copper—is mined. A housing shortage in this vital mining area has caused the DPA to get it listed as a critical defense housing area so that more homes can be built quick for the miners' families.

For your own ads

Many contractors made excellent use of the ad mats prepared by the National Adequate Wiring Bureau for small space in local newspapers. So a new series of six is being offered and another is in preparation. They are priced 50c per mat. Cartoon illustrations are used. A booklet, "Check Your Wiring," is also available to use in getting the names of prospects and conditioning them on an adequate job.

Stud gun safety

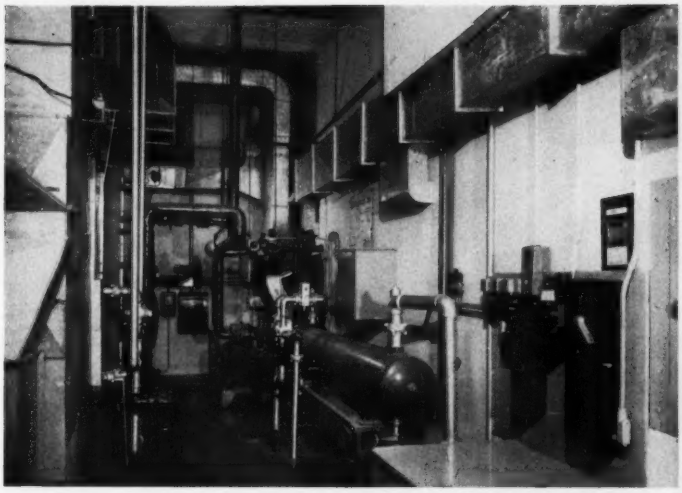
Cartridge or powder-operated stud guns have stirred a controversy in several places. The unions oppose them on the grounds of safety but are suspected of a traditional opposition to any labor-saving tool. Oregon's State Industrial Accident Commission, after an 8-hr. hearing, is preparing some safety rules that are pretty drastic. One is that no gun can be operated within 50 ft of another workman or bystander. Safety is important, of course, but killing a tool with rules is to kill the increased productivity on the job needed to pay for increased wages.

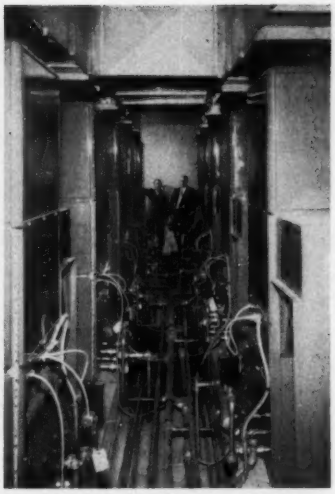
Revised

Wire tables of the California Electrical Safety Orders have been changed recently so that Types R, RH, RU, T and TW No. 10 wire is rated to carry 30 amp and No. 8 to carry 40 amp.

Across the border

The Electrical Inspectors Assn. of B. C., now independent, is considering becoming affiliated with a proposed Canadian Electrical Inspectors Assn. that parallels the IAEI. Reason for it is that the Canadian Electrical Code is different from the National Electrical Code in U.S.A. No action has been taken, however. Dates for the next annual conference of the British Columbia association have been set for Feb. 20-21 in 1953, at Hotel Georgia, Vancouver.





40-hp heat pump (left) installed in utility's office building. Right: Battery of twelve 10-hp heat pumps in Sacramento office building

Heat Pump Experience in Sacramento

Seventeen installations show first cost less, operating costs comparable to competitive systems

The heat pump has established itself as a successful development in the Sacramento area during the past few years. There are now 17 installations, nine of which are in commercial establishments with a total of about 400 installed horsepower. Since the heat pump has its greatest possibilities in the commercial field, discussion will be confined to that phase of development.

The climate of the Sacramento area is peculiarly fortunate for heat pump application. An installation sized to give correct summer cooling will usually have sufficient heating capacity for the winter.

Design Conditions

Generally accepted design conditions are 30 F for heating; 95 F dry bulb and 71 F wet bulb for cooling. There are about 2,700 degree-days of heating.

Interestingly, with present-day increased standards of illumination for commercial establishments, experience has shown that the heat from the lighting installation often makes it necessary to operate on the cooling cycle even when outdoor temperatures are moderately low.

For example, the Sacramento Municipal Utility District offices have a fluorescent lighting installation that gives a general illumination of about 70 f-c, and a heat balance between an outside temperature of 55 F and an inside temperature of 72 F. When outside temperatures rise above 65 F the heat pump must be put on the cooling cycle. Although the weather department shows degree-days for other months, the period of December to April, inclusive, is the only real heating period for most commercial establishments for reasons given above.

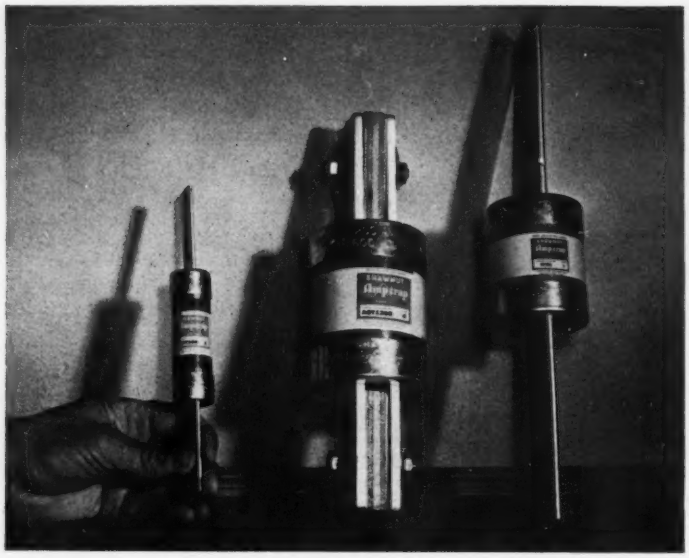
If this interval is taken as the heating period, the annual heating measure is 2,200 degree-days. Using this figure, it has been found that the average energy consumption for heating most commercial establishments is 0.5 kwh per degree-day per horsepower of installed capacity. This figure will vary from a low at 0.35 for a doctor's office to 1.0 for an office building where comfort conditions are maintained 24 hours per day.

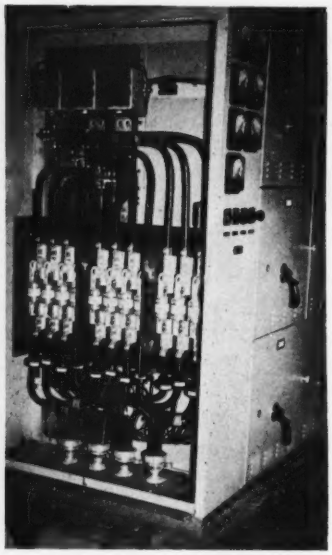
All of the heat pump installations make use of the water-to-air cycle. Almost without exception well water is used at a temperature of about 62 F because the Sacramento area is blessed with generous underground water strata. Smaller units discharge the water to a sewer or stream, but the larger installations use a disposal well. In general, it is not economically feasible to use the Sacramento city water supply as a source and the use of the city sewage system for disposal is of doubtful economy because the charge for such service is rather high.

Operating Cost

Economically, the heat pump appears to offer a saving in first cost over a standard gas-burning furnace plus a conventional compressor air-cooling job of equivalent cooling performance. Operating costs are about the same with gas, costing about 35c per thousand cu ft and electricity at 1c per kwh. Of course a heat pump takes much less room than that required by a gas-burning furnace and standard compressor air-cooling equipment of the same capacity.

From a utility point of view, the heat pump load is attractive. The annual load factor runs surprisingly high —over 35% when used in restaurants, and about 30% in mercantile places and offices. One explanation for the high annual load factor lies in the fact that the blowers of most commercial installations are operated 12 to 24 hours per day. In one large office building comfort conditions are maintained 24 hours per day. This particular installation operates at 41% annual load factor.





Three sizes of Amp-traps shown at left. At right, 12 800-amp Amp-traps protecting 50,000-amp interrupting capacity circuit breakers

Amp-Trap—New Low-Voltage High-Interrupting-

Any fuse-type device that will protect 600-v circuits against short-circuit currents of 100,000 amp and over must surely find wide application in industry. The Amp-trap is such a device.

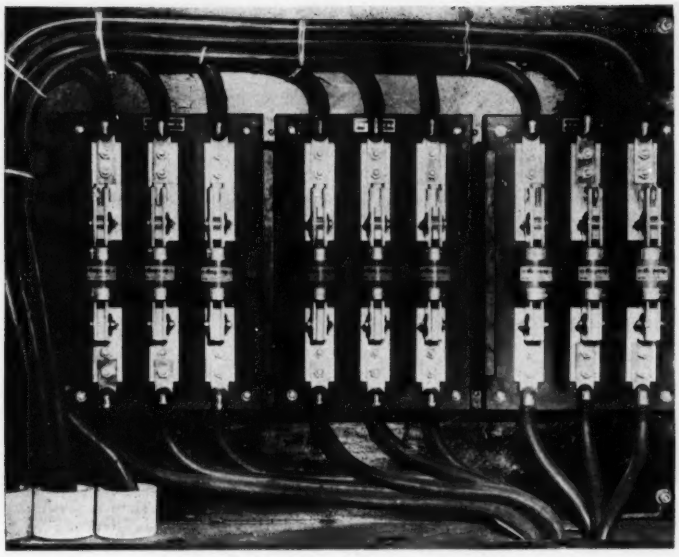
Installations on the West Coast of this comparatively new development by The Chase-Shawmut Co. are here shown in mills of the Weyerhaeuser Timber Co.

One is an installation of the Snoqualmie Falls, Wash., mill. Here the main generating station bus is 600 v, fed from two generators rated 3,750 and 5,000 kva and a transformer bank rated 5,000 kva connecting with the Puget Sound Power & Light Co. The Weyerhaeuser Engineering Department at Tacoma estimated the symmetrical short-circuit initial to be 170,000 kva, including motor feedback. This gave maximum current, including d-c component, of 245,000 RMS amp for a 3-phase fault.

A new load was to be fed from this bus. The circuit would consist of a 1,000-kva 600-4,160-v transformer, 60 ft of underground cable, 2,000 ft of overhead open line, 150 ft of underground cable, a 900-hp 4,000-v motor with full voltage starter and an auxiliary load fed from a 300-kva step-down transformer.

The problem was to provide a protective device in the feeder connecting the station bus to the 1,000-kva transformer. This feeder from the protective device to the transformer was to consist of 60 ft of three 500-MCM cables in parallel per phase. It was decided to install nine 1,000-amp 600-v Amp-traps between the station bus and a 1,600-amp circuit breaker that was suitable for overload protection but did not have sufficient interrupting capacity for short-circuit protection. The Amp-traps were installed in each of the nine (three per phase) 500-MCM cables between the station bus and the circuit breaker.

The other installation is at the Klamath Falls, Ore., mill of the same company. The problem here was similar to that at Snoqualmie Falls in that it was necessary to provide short-circuit protection for a 600-v feeder circuit, using four 500-MCM cables per phase. However, in this case there was the added problem of coordinating the short-circuit protection of the feeder circuit with 50,000-amp interrupting capacity breakers in the branch circuits taken from the load end of the feeder. Since the cable run was rather long, approximately 350 ft, it was also desired to maintain continuity of service by clearing a faulted feeder cable from the circuit without opening the unaffected cables. This was accomplished by using one 1,200-amp Amp-trap at the supply end of each cable and one 800-amp Amp-trap at the load end of each cable. It was calculated that it would be possible to obtain a fault of about 100,000 RMS amp at the load center, at the end of the feeder circuit. There would be approximately 25,000 - RMS - amp short-circuit current in each of the parallel feeders, which would be cleared in approximately .007 seconds by the 800-amp Amp-traps at the load end of the feeder, without blowing the 1,200-amp Amp-traps at the supply end of the feeder. In the event of an insulation failure involving one of the four parallel feeders, a short-circuit current would be obtained of approximately 32,000 RMS amp, which would be cleared by the Amp-traps at the ends of the faulted feeders, without affecting the Amp-traps in the other three feeders. In the event of a fault on a branch circuit from the load center of 40,000 RMS amp or less, the opening time of a 50,000-amp interrupting capacity breaker in the branch circuit would be faster than the Amp-trap, so that the fault would be cleared by the breaker without affecting the Amp-traps. In



Nine 1,000-amp Amp-traps installed behind air circuit breakers for 3-phase protection

Capacity Current Limiting Device

the event of a fault of 60,000 RMS amp or greater on the same branch circuit, the fault would be cleared by the Amp-traps at the load end of the feeder circuit, in approximately one-half cycle, before the breaker contacts could open.

Principle of Operation

Although the Amp-trap makes use of ordinary materials, the particular combination used gives remarkable results. The basic element is a tightly sealed glass fiber tube. For the 30-amp rating this tube is 2 in. long and ½ in. in diameter. In this tube is placed a pure silver link. Holes are punched in the link to reduce cross section so that fuse action is concentrated at these points. The tube is then filled with pure quartz sand and copper caps placed on the ends.

Silver, when melted or fused, has the very interesting property that the small amount of gas liberated is non-conducting. Other metals give off a conducting gas. Quartz sand also has an interesting property. When subjected to high temperature it fuses to form glass, giving off no gas in the process.

When the silver strip fuses at the spots of reduced cross section, glass discs are formed in the quartz sand. Since a low-voltage arc cannot re-establish itself through these glass barriers, the current is interrupted during the first quarter of a cycle.

All Amp-traps in the larger sizes are composed of the proper number of these small units in multiple. Ratings up to 4,000 amp are made in this way.

An interesting property of electrical contacts, and one not generally realized, is that very small contact surfaces will carry surprisingly large currents if heat dissipation is rapid. For instance, two 3-in. copper spheres making only spot contact through the curved surfaces will carry a current of 800 amp. This is because of the great heat-dissipating properties of the spheres.

This property is made use of in the assembly of the large Amp-traps. After the small single-link units are assembled in circular form, they are enclosed in a fiber shell and the ends pressed into holes in massive copper end pieces with large heat-absorbing properties. Precision manufacture of the fuse units, careful machining of the heavy end pieces, positive pressure and silver plating of mating surfaces, insure good end contact for all the small units and a high rate of heat dissipation. Copper blades extend from these end pieces as in cartridge fuses.

Operating Properties

The current limiting ability of the Amp-trap is measured in terms of the "let through current." This let through current, as the name implies, is the instantaneous peak fault current that the Amp-trap allows to pass before the current is interrupted.

Because of the fact that the Amp-trap begins to fuse in less than a quarter of a cycle, the let through current is only a fraction of the instantaneous peak short-circuit current available. For instance, a 30-amp Amp-trap interrupting a dead short circuit on a system of delivering 100,000 RMS amp at 600 v will have a peak let through current of only 5,000 instantaneous peak amp (3,000 RMS amp), and will clear the short circuit in less than two-hundredths of a cycle.

With this microsecond action of the Amp-trap the circuit would be interrupted even before the trip coils of a circuit breaker could become energized. That is why Amp-traps are being used as back-up protection to circuit breakers.

Application

Because of the high interrupting capacity of this new device and its microsecond action before any serious damage can be done, it constitutes an economical new approach to the problem of protecting low-voltage circuits.

Action is so fast that destructive magnetic forces cannot be built up in switchboard and panelboard bus structures or in bus duct feeder systems now so widely used. Insurance companies are becoming very critical of low-voltage protective devices because of the great potential hazard to life and property from the destructive effects of the high short-circuit currents available in modern industrial plants and commercial installations.

The Amp-trap appears also to be one answer to the problem of protecting services taken from utility underground a-c and d-c networks. These systems are capable of developing short-circuit currents in the order of 100,000 amp or more, and require special protective equipment. Time is of the essence in the operation of this protective equipment. The ideal device is one that will open the circuit so fast that destructive short-circuit currents do not have time to build up to dangerous values.

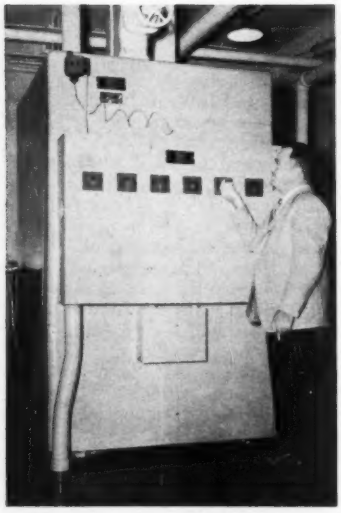
One of six Ajax induction furnaces (left) that have replaced gas-fired furnaces since plant was built. Enclosure resembling a panel contains all services needed, including 240-v power, water, air, instrumentation, SO^2, and other services. At right is shown one of three magnesium breakdown furnaces rated at 80 kw each. McCulloch Motors is emphatic in preferring the electric furnaces

Highly Electrified Industrial Plant

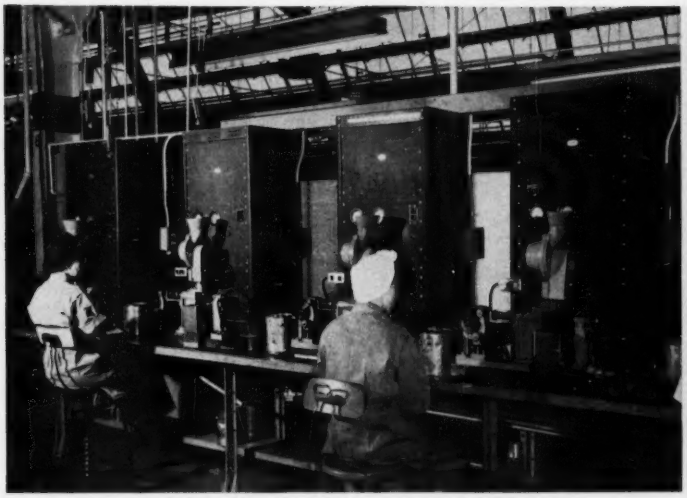
means more efficient operation and promotes good employee relations

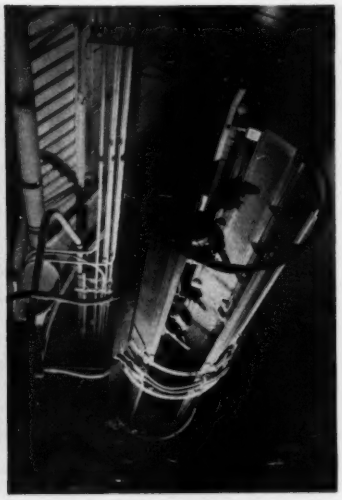
Lewis B. Reed

Industrial Heating Consultant
Los Angeles Department of Water & Power



Ample hot water for washing and showers is provided by the Coates 72-kw electric boiler shown at left. At right is shown one of the 14 unit substations in the McCulloch plant. This one is three phase and rated at 750 kva. Total, approximately 10,000 kva





Four high-frequency heat treating furnaces (left) built by Amrex Electric Instrument Co. to McCulloch specifications heat treat all rivets used in the chain saws. Each unit has a capacity of 2,900 large rivets, or 4,000 small rivets an hour. At right is shown one of four 52-kw Chromalox infrared paint drying heaters. McCulloch states that it prefers the rod-type unit for lower maintenance

McCulloch Motors is rated as one of the finest small industrial plants in the Los Angeles area and one of the most highly electrified. Today, after a $5 million expansion program, it has grown into one of California's outstanding industrial plants, and is one of the world's largest producers of lightweight engine-driven tools. Thousands of items, including various models of chain saws, water pumps and earth drills, are shipped every month to a world-wide chain of dealers and distributors. In addition, McCulloch is the major supplier of aircraft engines for military radio-controlled target planes.

A visitor to the plant is impressed by the way it plans for the future. Too many plants today are built for the needs of the present, and expansion comes dearly—especially when it comes to the adding of electrical load. The original plant had been designed for 4,160-v distribution, with unit substations placed at strategic locations. With this basic design, adding to the existing system presented few problems in comparison with those encountered by so many industrial plants in similar circumstances.

With the expansion program completed, there are now 13 unit substations installed, serving a plant load of approximately 10,000 kva. No spot in the plant is more than 80 ft from a substation. Production was planned for also, and the bus duct originally installed gave the desired flexibility needed in shifting various production lines to meet varying conditions. To give an idea of what management desires in the way of production, it estimates that two and one-half engines will come off the assembly line every minute. It is interesting to note that there is a complete layout of the plant in miniature, with a scale of one-half inch to the foot. All machines and areas are accurately indicated by models. A maintenance department has wiring problems to face when production lines can be changed so readily to meet varying production problems. Bus duct has proved that it is not too difficult to make the wiring changes.

Electric Furnaces

When the plant first went into operation in 1946, gas furnaces were used in the die-casting department for holding molten aluminum at each die-casting machine and an electric induction furnace was used for breakdown or melting. Today all the six holding furnaces are induction furnaces, and McCulloch Motors is very emphatic when it speaks of the advantages of electric furnaces. When it first started producing magnesium die-castings, the melting and holding of the metal were done by gas furnaces. They were the only type available. These gas furnaces were located close to the induction furnaces, where the operating conditions of the two different types could be compared easily.

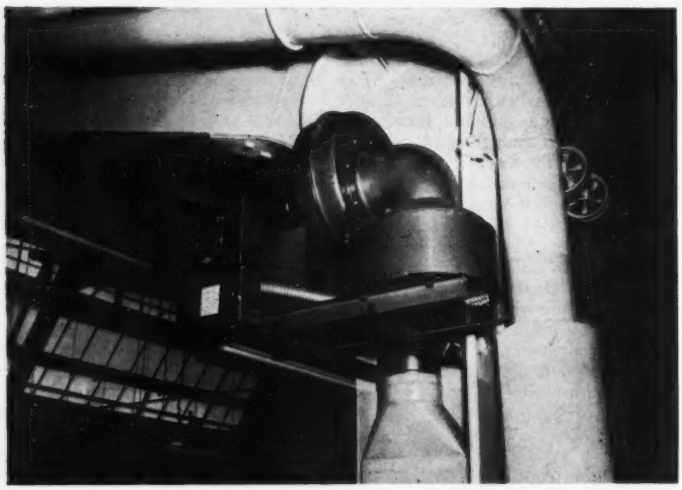
The electric furnaces were so much cleaner and the comfort of the operating personnel so much greater that there was no question as to which type was the more desirable. This is understandable, since die-casting operators everywhere have indicated their preference for electric furnaces from a personal comfort standpoint. As a result, specifications for electric magnesium furnaces were drawn; and the new furnaces were designed and built by Pacific Scientific Co. These included ten 20-kw holding furnaces with a capacity of 300 lb each, two hot metal transport pots with a rating of 20 kw each and three 80-kw breakdown furnaces with a melting capacity of 400 lb an hour per furnace.

McCulloch Motors describes the new die-casting department as being the heart of its operations. The department was designed with the intention of having it as the most modern die-casting department in the world. That almost 100% of its furnaces are electric and that each one has replaced a gas furnace is one of the best arguments that electric furnace manufacturers have for the sale of electric furnaces in this area.

Electric Space Heating

As is the case in the die-casting department, electric equipment has replaced the use of gas equipment for practically every function in the expanded plant. This even includes space heating. The original office area was heated by 156 kw of strip heaters located in the forced ventilation ducts

Heavy-duty ranges in the all-electric kitchen in the $1 million recreation building. This is part of facilities provided for employee use. Facilities include dining room seating 550, theater, sun deck, and 12-lane bowling alley. Employees may dine families on Sundays



Fifty of these fan-type Kilbury space heaters rated 13.2 kw each are used to heat the 152,000 sq ft of plant extension area. Electric space heating had proved such a boon in the original plant that it was used in the extension. Total space heating load is 1,000 kw

and a part of the general plant area with five 50-kw electric space heaters. Electric space heat had proved to be such a boon that it was decided to heat the added 152,000 sq ft of floor space electrically. The installation includes 50 13-kw space heaters, making a total of more than 1,000 kw of electric space heat in the entire plant.

Water Heating

Usually water heating in a plant of this type is not a large problem, but in the expanded plant 40,000 sq ft of floor space in the basement were used for locker facilities. This tiled area is spic and span with the most modern equipment, including showers. With nearly 2,000 employees and beautiful tile showers, water heating becomes a problem. This was solved nicely with the installation of a 72-kw electric boiler. It is interesting to note that the lockers themselves are integrated into the ventilation system; air is pumped into the rooms and is exhausted through the lockers. This continuous flow of air dries and freshens the clothes. Other electric boiler installations include two boilers rated at 150 kw each for the cafeteria and a similarly rated one for a degreaser on the production line.

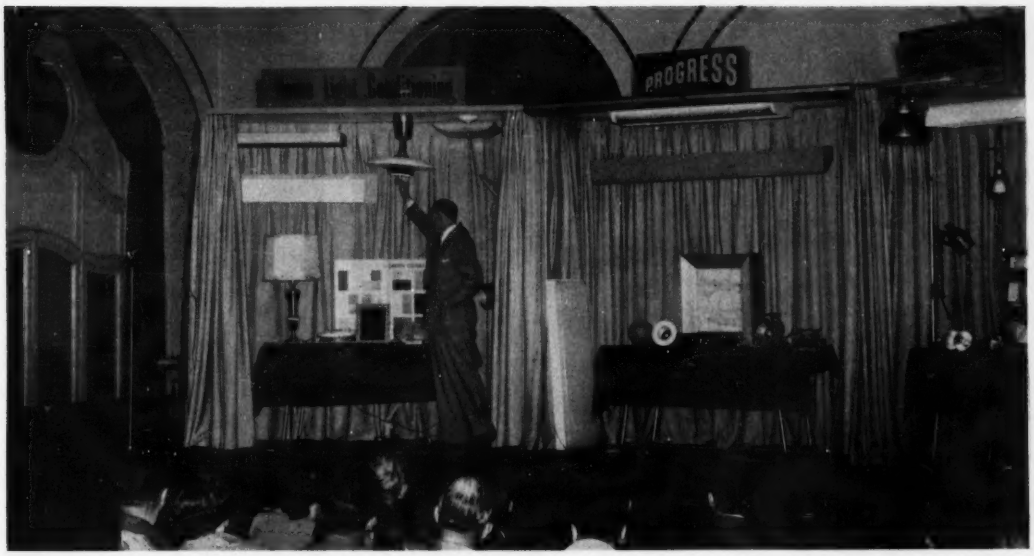
Employee Relations

McCulloch states: "Our public relations program begins at home, with our employees. We believe money is well spent when it can provide attractive working conditions, such as company bowling alleys and a theater, tiled locker rooms and showers, in addition to security benefits and bonuses." The result of this kind of thinking is a million dollar, beautiful concrete and brick recreation building, containing almost 90,000 sq ft of floor space, and entirely devoted to dining and recreational facilities. The ground floor, designed around a landscaped terrace, contains the dining room that seats 550 persons, cafeteria and an all-electric kitchen in which are prepared three excellent low-cost meals daily for their employees, every day in the week. The second floor has a theater, lounge and sun deck. In the basement is the 12-lane bowling alley with semi-automatic pin-setting equipment. The desirability of such a recreation center in furthering labor-management relations is proved by the swarm of employees and their families who congregate there on Sundays for dinner and recreation. It takes a 750-kw 3-phase transformer to serve power in this building alone.

Manufacturers, plant superintendents and laborers enthuse when they visit this concern. Everything has been provided with surroundings, equipment and planning to induce the utmost production in the most painless manner possible. Published statements of their profits prove the value of their ideas on production, employee relations and extended utilization of electric energy. Last year's sales volume exceeded $18 million and this year's is expected to hit $28 million. Profits before taxes amount to about 30% of gross sales.

All in all, a remarkable investment, a wonderful place to work, a tribute to long-range planning and an inspiration to all electrically minded persons who know that the *electric way* is the best and most modern way.

● **High-voltage transmission** lines have been absolved of much of the blame for radio interference by H. L. Rorden and R. S. Gens, Bonneville Power Administration. Principal source of noise seems to be low voltage transmission and distribution pin-type insulated lines. Induced coupling carries interference into homes.



Spectacular highlight of both the San Francisco and Victoria meetings was Alston Rodgers' dramatized review of lighting progress

IES Conferences Enlighten the West

Two lighting conferences, one in San Francisco, the other Victoria, brought to the West the very latest information from all over the world on light sources, techniques, research, trends and equipment. They were the two regional conferences of the Illuminating Engineering Society. The South Pacific Coast conference was held at Sir Francis Drake Hotel in San Francisco March 13-14, under the general chairmanship of H. H. Robison, Pacific Gas and Electric Co., Oakland. The Pacific Northwest regional conference was held at Empress Hotel, Victoria, under the co-chairmanship of P. A. Donnelly, Northern Electric Co. Ltd., and E. W. Thompson, Pacific Distributing Co., Vancouver, B. C.

The programs at the two meetings were somewhat different, although some national figures appeared on both programs. Sam G. Hibben, Westinghouse Electric Corp. of Bloomfield, N. J., national president of the IES, addressed both conferences and brought them tidings of the purposes, plans and program of the society. Willard C. Brown, General Electric Co. Lamp Division, Cleveland; W. P. Lowell, Sylvania Electric Products, Salem, Mass.; and George J. Taylor, eastern sales manager, Day-Brite Lighting Inc., New York City, were also on both programs; and Alston Rodgers, General Electric Co. Lamp Division, Cleveland, brought his spectacular stage presentation, "A Salute to Lighting Progress," to both meetings.

Chairmen of the various chapters and sections of the IES served as session chairmen at each meeting. In the San Francisco conference S. M. Blacksmith, PG and E, Oakland, Northern California Section, presided at the opening session. S. H. Simonsen, Ruby Lighting Corp., chairman, Southern California Section, handled the afternoon session, and L. E. Barnum represented the Mother Lode Chapter, Sacramento, at the evening session. B. H. Hartley, Falcon Engineering Co., chairman, Arizona Chapter, Phoenix, presided at the Friday morning session. There was no representation from the Utah Chapter except Douglas Peck, a local representative and an electrical contractor of Provo, Utah.

At the Victoria meeting, H. J. Ashbee, chairman of the B. C. Section, presided at the first session; Freeman C. Scharr, chairman of the Puget Sound Section, at the afternoon session; E. R. Fletcher, chairman of the Oregon Section, on the Friday morning; and Dave G. Parker of the Inland Empire Chapter, the last afternoon.

Regional conference committee, headed by H. H. Robison for the South Pacific Coast region, included Sam. H. Hazleton, papers and program; Matt A. Cabot, reception; W. R. Major, membership; J. S. Walsh, attendance; C. T. Bakeman, entertainment; C. W. Macy, hotel; Ward Shafer, finance; R. L. Sawyier, publications; Harry McMasters, publicity.

The conference committee for the Victoria meeting, headed by P. A. Donnelly and E. W. Thompson, included W. J. Lind, papers chairman; E. E. Ackland, finance chairman; H. N. Walters, extension chairman; B. Manlove and P. S. Fletcher, printing and publicity; M. Murphy, reservations and registrations; G. Langdon, banquet and luncheon; K. Reid, entertainment; Mrs. K. Reid, ladies' entertainment; A. Evans, properties; and other members were R. G. Scott, H. J. Ashbee, T. H. Doherty and E. Jarvis. Regional Vice-president K. E. Hollingsworth, Puget Sound Power & Light Co., Seattle, was active in the general planning of the entire conference.

Martin Hibben Robison

Prideaux Coleman

President's Address

Sam G. Hibben
National President, IES
Westinghouse Electric Corp.
Bloomfield, N. J.

More of the human aspects of the benefits derived from the work of the Illuminating Engineering Society, instead of an enumeration of its committee organization and research projects individually, were covered in an inspirational way by Sam Hibben, IES president and a pioneer in research and application of lighting. While he told of the aims and projects of the society in broad terms, its work in various fields and its purposes, he interpreted these in terms of added productivity to industry, aids to education, greater safety, and then he stressed the use of light for enjoyment and to give variety and beauty to living. He dramatized the value of eyesight by many homely examples. The one-fifth of school children who cannot see well enough in poorly lighted classrooms to absorb information being imparted to them, the more than 20% of the best young manhood of America whose eyesight is below the military service standards, were examples that he gave.

Recalling that in the 10 years since he had been to the West Coast tremendous strides had been made with the introduction of many new lighting sources and tools, he projected to the horizons ahead for further enhancement of human life and vision through the work of the illuminating engineer. His talk was full of colorful phrases. One of them, "The tiny lightning bug on top of an ornamental post alongside the street in this day of high-speed traffic is not enough to provide seeing for safe driving."

Of the support of lighting development and education by the industry, he told how much the society received from its sustaining memberships. "This is a minuscule crumb from an industry that sells over a billion kilowatt-hours a day in lighting alone."

While the American people use more light than any other nation and the measure of it is that there are about six lamps per person in the U.S.A., the horizon Hibben pointed toward was to far greater and more beneficial usages in all the fields of illumination.

New Electric Discharge Lamps

D. W. Prideaux
Illuminating Engineer, General Electric Co.
Lamp Division
Los Angeles

So rapid is the advance in the electric discharge field that, of the 24 types of lamps he reviewed, Prideaux said three had come out in the last month and one so recently that he did not even have the characteristics. There are at least seven or eight new fluorescent lamp types, many new flash tubes, ozone lights, mercury lamps. He then explained the characteristics of each and pointed to some of their applications. Most significant were the new color-corrected mercury lamps for either industrial or street lighting use. He analyzed the costs of the color-corrected mercury lighting with the straight mercury, or mercury and filament lamps in combination. He announced three new cold cathode lamps in the 48 in. length in standard cool white, warm white and white; some new preheat fluorescent lamps, a new instant-start 40 w for high humidity applications; and spoke of an installation of 360-cycle operation producing higher intensities and reducing auxiliaries to very small condensers instead of ballasts.

New Filament Lamps

Charles R. Long
Pacific Coast Engineer, Westinghouse Lamp Division
Los Angeles

With showmanship and humor, Long paraded the new light sources in the incandescent filament field that have been recently developed, with particular emphasis to their use in industry. Among the lamps that he showed were the new milk-white inside frosted lamps in the smaller wattages, tiny reflector lamps for use in buses, airplanes and special spotlighting applications; new reflector lamps in which the color is in the glass itself in a variety of shades; new rough-surface reflector lamps with the filaments mounted on springs to take up the shocks; new larger wattage residential inverted reflector lamps; a number of sealed-beam floodlights and spots; some large wattage industrial reflector-type lamps for highbay mounting; reflector-type heat lamps of high wattage. Although troubled with inadequate wiring and octopus outlets, Long's good humor and "smash" technique entertained and instructed at the same time.

Electro-Photo Luminescence

William P. Lowell Jr.
Sylvania Electrical Products
Salem, Mass.

The prospect of numerous architectural applications for a new light source is inherent from research into the phenomena of photoelectric luminescence, which was announced first at the IES convention at Pasadena a year and a half ago. Lowell exhibited glass plates that were made to glow in several colors. Although still in the developmental stage, the process has been used to achieve light intensities adequate for

Lowell

Broida

some practical applications, he said. He suggested luminous stair risers, luminous side walls of escalators, lighted cocktail table tops, decorative applications in homes.

Electroluminescence is produced by exciting a film of phosphor in a dielectric that is placed between two conducting plates, one of which permits the light to be transmitted, such as conducting glass. The materials luminesce directly under the influence of an electric field, which must be fluctuating. Intensity depends upon potential and frequency but the limitations are the breakdown of the dielectric. Effective life is still unknown and only three colors have been produced so far. Unit costs have not yet been established and the work is still in an experimental stage. Efficiencies are low—between one and three lumens per watt. The lamps burn with a leading power factor. Stroboscopic effect is greater with some phosphors than others.

Lamp Performance on Series Ballasts

E. E. Coleman
District Engineer, General Electric Co., Lamp Division
Los Angeles
At San Francisco Meeting

and William P. Lowell Jr.
Sylvania Electric Products
Salem, Mass.
At Victoria Meeting

A summary of the paper presented at the last IES convention on "Fluorescent Lamp Performance on Series Ballasts" reviewed the fundamental preheat circuit, the function of the ballast and starter, how the lamps start, a comparison of preheat and sequence starting. It described the preheat series sequence circuit and lamp starting on fundmental series sequence circuits. It also went into the advantages of series sequence circuits, both the preheat and instant start, and comparisons of various manufacturers and the effect of various factors on lamp life operation, such as wave shape, temperature, humidity, etc. Hope was held out that the new specifications since Dec. 31 would bring about a correction of many of the objections and difficulties found with the former sequence ballasts.

In discussing this paper H. V. Hjermstad, vice-president in charge of engineering, Sola Electric Corp., doubted whether the use of a resistor would provide an adequate means of checking ballast performance as stated in the paper. The ballast, he said, is an electrical network, a combination of resistance, reactance, a condenser, etc., in a complex network to supply energy to a lamp, which itself has negative characteristics and would take all the energy that could be supplied it. All of this results because of still inadequate testing instruments and he suggested the use of standard ASA ballasts as a basis for test with a direct-recording oscillograph.

Lowell agreed that the resistance was inadequate but that it would do for the time being until better methods are developed. He said that one thing that bedeviled all manufacturers, both of lamps and of ballasts, was the lack of uniformity, both of the performance of lamps and of ballasts, and likewise a difference in design of series

Blacksmith

Hartley Simonsen

ballasts. Sometimes the combinations "have given the customer a devil of a nuisance," he said, but lamp companies and ballast manufacturers are trying to run down the causes.

Use of 480/277 System

Harold L. Gerber
Electrical Engineer, Coddington Co.
San Francisco

Emphasizing that the National Electrical Code limits the use of the 277/480 Y-connected system to industrial applications and for use not less than eight feet from the floor, Gerber went on to analyze the applications that could be made of this in industrial plants and to show the limitations. He said the designing engineer must take into consideration all the factors and balance them against each other. One thing he pointed out was where the 277/480 system is used an entirely separate system at 120 v must be furnished for office machines, local lighting, portable tools, photoelectric cells, etc., as well as convenience outlets. Savings in copper and also in conduit are possible in large industrial applications. (Gerber's paper will be printed in the next issue of ELECTRICAL WEST.)

Scott Beamer, consulting engineer, told of applications of such a system to the Western Wax Paper Co. plant in Oakland.

Ultrahigh Intensity

Ted Broida
Engineer, USN Radiological Defense Laboratory
San Francisco

Needs for exceedingly high intensity sources of radiation for certain types of biological, medical and military signaling research were first touched upon and then four available sources were discussed. These are the high-current carbon arc with the cerium core, covered with coke; the short-arc mercury; the xenon arc; and the aluminum oxygen furnace. The characteristics of each and their problems, as well as the difficulty of developing measuring instruments, were discussed. Broida then demonstrated the high-intensity short-arc mercury in a reflector and that the focal point of the beam ignited wood, steel wool, and melted lead.

A Salute to Lighting Progress

Alston Rodgers
Illuminating Engineer, General Electric Co.
Lamp Division
Cleveland, Ohio

That star showman and lecturer, Alston Rodgers, brought his traveling "Salute to Lighting Progress" to the West just in time to make both of the

Hjermstad Gerber

Willard Brown L. H. Brown

IES conferences. He was featured at a big public meeting at both of the conferences to greatly enlarged audiences. With a portable stage in three sections he told of and demonstrated new lighting materials, light sources and fixtures in home light conditioning, in industrial applications and in commercial and school lighting. The show was put on with spectacular effects and humor, and precision demonstration. With color-slide illustrations he extended the scope of his demonstration to new developments in lighting all over the world, including control of plant growth, fluorescent street lighting in England, new industrial and commercial techniques, and the light recipe idea applied to home light conditioning. The show ended in a spectacular flash lamp display simulating sky rockets.

Integrated Ceilings

H. L. Wollman
Research Engineer, Capital Co.
San Francisco

There is a growing trend toward a new type of functional integration of ceilings that will provide not only all services such as lighting, air conditioning and acoustical control, but also a comfortable and cheerful feeling. Some are being produced now as packaged factory-made assemblies for new construction in which everything required in the ceiling is furnished in one package. It is also possible to assemble an integrated ceiling with materials available on the market, Wollman said. He cited the installation recently made at the Oakland branch of Bank of America as the best lighted of all of its 526 branches.

Reuben E. Lagerstrom, discussing the subject, said he liked to work luminous ceilings at 100 f-c to assure satisfaction with the installation. He said that luminous ceilings in residences, lobbies and building entrances are being explored and offer great opportunity for color. He mentioned the new library of the University of California, giving 120 f-c on the working plane with 3.8 w per sq ft as an outstanding example.

Glare Control

William F. Jones
Consulting Engineer
Menlo Park, Calif.

A comparison of research in the field of direct glare by Sylvester K. Guth and the results achieved by other workers in this field, particularly the Harrison-Meaker system of glare ratings, was first made. Guth's formula relates all factors known to be effective in producing glare and gives a scale upon which relative comfort can be determined (Illuminating Engineering, November 1949 and February 1951). Jones pointed out the present limitations on the application of this work and suggested lines along which further research will probably proceed.

Office Seeing Comfort

George J. Taylor
Day-Brite Lighting Inc.
New York

Virtues of seeing comfort in office lighting are obtained from greater attention to brightness engineering and lighting design. Ease of seeing varies from 65 to 3,200 f-c for various conditions of paper, ink, type size and other factors, he said. Taylor feels that sight engineering that correlates both foot-candles and foot-lamberts with all of the physical factors of the room is needed to develop a common ground

between the illuminating engineer, the customer and the architect. In his opinion comfort seeing can only be had with an all-troffer installation, using controlling lense plates. Luminous indirect lighting is very good but not for low ceilings, he felt.

Color Measurement Importance

Dr. Leland H. Brown
Department of Electrical Engineering
Stanford University

Matching for color and the relation of light to this problem was discussed. Best light is artificial daylight, Brown said, and next best is incandescent light with filters. The de luxe cool white is the best of the fluorescent sources, in his opinion.

Grading Belt Lighting

Robert Ryan
Lighting Consultant, Southern California Edison Co.
Visalia, Calif.

Color discrimination under artificial light was further discussed by Ryan. He referred particularly to grading belt lighting in packing plants. He made the significant point that, the higher the intensity, the less becomes the factor of color in the light source. A combination of warm white and of cool white fluorescent lamps has been found best for color discrimination in a series of tests made in fruit canneries in 1948. The McBeth unit for grading lines was described as a very satisfactory unit and a number of installations with the results obtained were described. Black light is also being used successfully to detect mold and decay in oranges and other citrus fruits, said Ryan. The mold fluoresces under black light.

Black Light In Industry

Marcel Vogel
President, Vogel Luminescence Corp.
San Francisco

That black light has many commercial and industrial applications was further discussed by Vogel. With the development of tubular low-wattage sources of long-wave ultraviolet radiation and subsequent filtering, a source of black light is now available to produce suitable pieces of industrial equipment economically, he said. Applications of black light in medicine and industry were discussed, such as detection of ringworm, hardening of the arteries, certain surface malignancies, detection of animal infestation in foodstuffs. Considerable time was devoted to the candling of eggs by the speaker. Vogel said that between five and six billion eggs a year are being graded by ultraviolet to determine quality and grade.

Wollman Taylor

Capitol Annex Building

Menno N. Harder
Senior Electrical Engineer, Division of Architecture
Sacramento

The de luxe lighting in the new state capitol annex at Sacramento was described. Extensive use of recessed louvered units in louverall ceilings was noted (See ELECTRICAL WEST, August 1951, p. 78).

Industrial Lighting Revolution

W. C. Brown
Manager of Engineering, General Electric Co.
Cleveland

There is underway in effect what well may amount to a revolution in industrial lighting, said Brown, who is manager of application engineering, Lamp Division, General Electric Co. He said that except for changing filament lamps to fluorescent lamps and the mounting of luminaires in continuous rows there has been little or no change in the optical design of general industrial lighting fixtures since 1919. Shielding of lamps by the lighting fixtures has not improved since. Why should not the factory workers have as comfortable seeing conditions as do their contemporaries in offices? Several forward-looking fixture manufacturers are developing what amounts to a new type of industrial lighting fixture. This will have better shielding of the lamps, plenty of upward light, high light output, design for ease of cleaning, and light-colored or luminous sides to reduce harsh contrasts inside of the fixtures and the relatively dark outer surfaces. Some experimental fixtures of this new type were demonstrated by Brown.

Lighting In Europe

W. C. Brown

In a separate discussion, Willard Brown told most interestingly of his observations of lighting abroad while on a recent visit. The British are far ahead of us in the use of fluorescent lamps for street lighting, he said. Results are so effective in the form of good visibility and eye comfort that fluorescent street lighting is bound to come to America. The very best lighting installations in stores, factories, offices and schools compare favorably with ours, only they are far fewer in number, Brown showed.

Regional Vice-President's Address

Carl O. Martin
Benjamin Electric Mfg. Co.
San Francisco

As regional vice-president, Martin welcomed the new Arizona Chapter of IES and said he looked forward to the formation of a San Jose Chapter. He reviewed the work of the sections and chapters and praised the accomplishments of all. He expressed appreciation for the fine work of the committee who had worked so diligently to make the San Francisco conference an outstanding success.

New Home Lighting Concept

Dorothy McGregor
B.C. Electric Co., Vancouver

Presenting for the first time a paper by a woman at a Northwest conference, Miss McGregor's talk was built around the lighting recipe booklet, and featured a combination living and dining room on the stage with which she illustrated the recipes. She covered the types of lighting recommended in the booklet, showing how they may be applied easily in any home and with available standard equipment to be found on the market. This colorful subject brought home to the delegates the importance of more activity in this little considered field.

● **Digests of the papers** or talks presented by Beverley A. Travis, consulting engineer, Seattle, on "Standardization of Fixture Design"; of John M. Chorlton, Toronto Board of Education, on "School Lighting in Eastern Canada"; and of E. B. Karns, Westinghouse Electric Corp., Cleveland, 'Street Lighting, a Science" were not received in time for this report, unfortunately.

At both of the conferences President and Mrs. Hibben were honored at a banquet tendered by officers of the region's chapters and sections.

ELECTRICAL WEST

American P&L Stays American

DIRECTORS of American Power & Light Company last month voted to stay American. In agreeing to distribute the common stock of Washington Water Power rather than to sell it to three PUDs, the directors courageously upheld the traditions and principles of American free enterprise. For this decision the whole electrical industry, as well as the great majority of the citizens of eastern Washington and of Idaho, salute and commend them.

Washington Water Power has been involved in a seven-year struggle to come out from under holding company ownership and domination as an independent, integrated investor-owned utility. That it succeeded is a fitting tribute to Kinsey M. Robinson, WWP president, and his associates, for their determination and zeal to maintain the identity and independence of a great and good public service organization. That their fight had purpose and merit, and that their ideals were right, was demonstrated by the support that they won. Not only were all of their friends in the electrical industry behind them, but they also had the backing of an aroused citizenry of Washington and Idaho.

Washington Water Power has an outstanding past record as a good citizen wherever it serves. Now its future has an unlimited horizon for even greater accomplishment and service.

Better Communications

AS UTILITY systems have grown in size and complexity, so too have their requirements for intracompany communication facilities. These facilities and the duties they perform cover a wide range. They include company-owned wire circuits, leased circuits, power line carrier, telephone carrier, microwave and mobile radio. Their functions range from ordinary voice communication to telemetering supervisory control, relaying and a multiplicity of other control functions.

One of the great drawbacks to the most effective use of these facilities has been the inability to interconnect company-owned circuits with those leased from the Bell systems. This deficiency no longer exists. The Bell companies under a newly announced policy will now permit connections with power company communication facilities whether they involve wire, carrier or radio circuits. These interconnections can now be made regardless of location with respect to base rate areas, provided they are by way of any complete telephone facility, including teletypewriters.

This new policy (one communication engineer remarked that "it was a long time coming") now make possible maximum flexibility and efficiency in utility communications. It commendably typifies the fine relationships between the Bell systems and the electric utilities.

Next in the Tax Line

WITH federal and state budgets rising to unprecedented heights and with potential sources of new revenue apparently exhausted, how much longer may municipal utilities expect to enjoy the benefits of exemption from income taxes? The legislative history of the Revenue Act of 1951 as passed by Congress suggests that there is perhaps less permanence than was heretofore believed in the special tax treatment of municipal utilities. Two developments tend to confirm this possibility.

Congress attempted with considerable success in the 1951 act to eliminate certain inequities and discrimination that had resulted from previous tax laws. Notable was the repeal of the 3½% federal tax on domestic and commercial sales by privately owned utilities. The House Ways and Means Committee and the Senate Committee on Finance both labeled this impost discriminatory since it applied only to consumers of one kind of utility.

Many heretofore exempt business sources of possible tax revenue were examined and provisions for exemption were either ma-

EDITORIAL VIEWS

terially lightened or entirely eliminated. Among these were the taxation, under certain conditions, of mutual savings banks, a somewhat different and more restrictive treatment of exempt cooperatives, and the taxation of business income of state colleges and universities. The last of these touches more closely on the proprietary activities of cities running their own utilities. Income taxes are applied "to any college or university which is an agency or instrumentality of any government or any political subdivision thereof." The step from a municipal educational institution to a municipal utility is not a wide or an impossible one.

How long it will be until the long arm of the federal tax gatherer reaches municipal proprietary operations cannot be foretold with any accuracy. However, the present trend seems to be definitely in that direction.

Building Plant—or People?

PERHAPS it is natural for the executive who came up through accounting to think in terms of building up a company financially, and for the engineer to be most interested in building plant, but in either case it still requires people to operate the business, keep the books, build the plant, and meet the customers. Before companies grew as big as today or unions to such size by preying on the self-pity of the people employed by a company, the human component of a business was expected to adjust itself to plant, finance and conditions of work.

But now it is different. Workers are made acutely aware of themselves by the "grievance" talk, the political propaganda, the talk and training to which they are subjected. It is harder to generate loyalty than ever before because a person is pulled from several directions at once to demand his loyalty. Just a series of classes on Americanism won't do it, as one person expressed it:

"We go to expensive classes to tell us our freedom is precious, etc. Then we see the very reverse being practiced every day under our very noses. What are we to believe?"

To build *people*—set a good example.

MY question is: Why can't the Union and the people who are in the Union deal in a Christian manner with management? It seems to me that there is more to be gained by cooperating in every way possible to try to increase the company's profit rather than to drag our feet and cuss the company for making a profit by the sweat of our brows. The days of the coal and iron police are over and I don't think management or even the stockholders would want to go back to these methods even it if were possible. But even if it were, the purpose of our working here is to make a profit. It is our duty in all honesty to give a fair day's work for a day's pay. The employee has a stake in the company even if he does not own a single share of stock. He has a job that represents an investment of from five thousand dollars upward. He doesn't own the job because some one else invested the money to make the job for him. The amount of money the employee makes on the job will depend upon how much money he makes for the investor. It's as simple as that. If he does not produce, it is economically impossible for him to make more money, and no amount of grievances or strikes can change it, and the employee loses his stake in the job. Reform begins with self. If we do not deal fairly with the company, we cannot long expect them to deal fairly with us. I think that every man and woman who works should deal honestly and fairly with their employer, then if the employee does not get his just reward the Union has something definite to work on when they take the case to management . . . I hope to see the time when employees and management both deal in the Christian manner with each other, and with everybody. Why not give it a try?—George Snodgrass, tester in Westinghouse Switchgear Division, in a letter to the "Union Generator," newspaper published by Local 601, IEW-CIO.

How to Sell CLM Lamps

Cheyenne salesman's method gets results

There is no substitute for old-fashioned door-to-door selling, according to George R. Launderville of the Cheyenne Light, Fuel & Power Co., Cheyenne, who has made an outstanding success of selling IES and Certified lamps over a period of years. During his 16 years of lamp selling his best record was an estimated 100 plus sales per month in 1935.

His continuous success in selling lamps is attributed to his own technique, which he has worked out through experience. Here it is:

1. First Approach

It is is very necessary to know the potential customer by name, Launderville maintains, and to call her by name in a friendly way when she first meets you at the door.

The first approach is very short. Present your card and say something like, "I'm George Launderville from the Cheyenne Light, Fuel & Power Co." Then continuing, "I'm calling to do you a special favor. The company is demonstrating a new type of lighting. (Don't under any circumstances use the word 'lamp' or even 'light.')

"This soft, diffused, no-glare lighting is highly recommended for any of the 'seeing' activities such as reading, studying, sewing, bridge. Now with your permission, and no obligation whatsoever, we would like to have you try out this lighting and give us your reaction to it. We would like to have you use it a few nights and comment on it."

2. Leave a Lamp

The salesman has to be the judge of what type lamp is best to leave as the demonstrator. Usually the large floor lamp (incandescent) is a good bet. Some people prefer the bridge combination incandescent and fluorescent lamp. After the lamp is planted in the home, go over the specifications in detail with the housewife, unfolding the lighting story of Certified lamps.

3. Call Back

A week or so later, if the sale can't be closed with the housewife, it is necessary to go back in the evening when the husband is at home and relate the lighting story to him, so that no alibis can be offered. Any lighting demonstration is more effective in the evening, too. So show what your lamp can do.

Show in the pamphlet the many kinds of Certified lamps that are available, so your prospects will see that they can have a choice. Remember experiments have proved you can reach the customer's brain through the eyes 23 times as effectively as through the ears. If necessary, go into your reserve selling talk, which should be unlimited as far as your ability and knowledge are concerned.

4. User List

"Use the user." Whip out your list of satisfied customers, some 75 or 100 people who have bought Certified lamps recently, many of whom the wife or husband will know.

Once in the home, by observation and talking to the prospective buyer, you can learn what the family is most interested in, what their hobbies are and what type and how many additional lamps will be needed at some future date.

5. If They Talk Color

The great majority of women, whether they come in the store on their own initiative to buy a lamp or whether they are contacted by a salesman, will begin talking about decoration and color scheme first. You may show them the leaflet "Certified for De*Light*ful Living," which contains beautiful illustrations of the various types of Certified lamps and their advantageous placement in modern and period rooms. Sell the buyer the idea that shades and lamps are designed by interior decorators, not only to give you the finest in style and beauty. but also by experts to give 50 to 100% more light. The very contours and dimensions have been determined by the best designers to give the maximum of pleasure to the artistic eye. And there is a range of color, trimming, material and shape to suit every taste and requirement. In addition, the scientifically correct lighting is a boon to health through the eyesight.

George Launderville brings light and sight

6. Adapt to the Customer

It is very essential to adapt your remarks and approach to the personality of each potential customer. "The trained salesman understands human nature." And experience is the best teacher. For instance, if the housewife likes to talk a lot, you be a good listener. If her interests are cultural subjects, try to answer at least intelligently. If the absorbing interest is a family, be sympathetic, never failing to connect the customer's situation with a need for your product.

7. Prospects from Buyers

After you have made a sale the woman is always pleased to show her new lamp to her friends, neighbors, club members and, with encouragement, she will give you a number of prospective buyers. In this way you use the names of satisfied customers again and again and your clientele will become almost unlimited.

Also, any time you make a service call in a home or return some repaired appliance you have an opportunity of noticing whether there is a need of more lamps or better lamps.

8. Survey—Contact Method

The Cheyenne Light, Fuel & Power Co. has stressed the advantages to salesmen of the service call and the return-of-repaired-appliance call in building up business. Late in 1948, it instituted the "survey-contact method" of getting sales. Each salesman keeps a card index file listing every resident, including address and phone number, in his territory. The card contains a printed list of appliances—range,

water heating, house heating, ironer, floor lamps, electric blankets, electric dishwasher, deep freeze and disposal.

At his first call the salesman checks all appliances in the home. On the card he makes a note after each as to the kind, the age, the condition. In his office the salesman makes further notes on the back of the card and transfers the card from the file by address into the file by date, so that he will have his future prospects set up at his finger tips.

The back of a typical card reads:

"Contact on house heating 3/20/52.

"Contact on Cer. Lamp May 18 for wife's birthday.

"Contact on old water heater in July."

The survey-contact method is a means of getting much repeat business by keeping in touch with needs. It is especially good business sense for a utility company as it not only stimulates sales, but also creates good will among dealers and increases sales for them all in Certified lamps and all other appliances. Its work always creates more business than the utility itself closes.

"Success in selling depends on your knowledge of the merchandise and your ability to convince people of it's worth," says Launderville. "Sell customers all of the advantages of the product. They will not know of the technical points of its performance unless you teach them. Salesmen are educators.

"Success in selling depends upon work and more work. It was the tendency of salesmen after World War II to feel that direct selling was not necessary. That people would come in and buy what they wanted is now passé."

George Launderville says he noticed the mood of the public began to change early in 1951. Former limited stocks and manpower shortages have been supplanted by overstocked warehouses and a highly competitive market, so that direct selling now is accomplished by much promotional effort. It is creative selling. Salesmen are psychologists, not order takers. Furthermore he feels that salesmen are the apostles of free enterprise, the exponents of a free economic society, of Democracy versus Socialism.

● **Seattle Appliance & Music Assn.** has been having regular monthly meetings of general interest to dealers of the area, among which on March 11 was one about the new University of Washington FM radio station, by E. D. Adams, its manager. An earlier meeting heard Howard McMahon on accounting for the dealer.

"Electrical Living Month" Plans

Year's program announced by No. Calif. Electrical Bureau

May has been designated "The Month"—which means "Electrical Living Month"—by the Northern California Electrical Bureau, in announcing its program of activities for the remainder of the year.

In addition it plans 29 rural electric cooking schools for the year, participation with local units in 14 or more county fairs, a television promotion program when timely, participation in five or more model homes with adequate wiring and light conditioning, and sponsoring of two or more model schoolroom lighting installations. In addition, the usual Christmas lighting activity will be aided by the bureau. An automatic clothes dryer promotion and some of the cooking schools have already been carried on during the preceding three months.

Details of the electrical living month promotion are being distributed to the local units of the bureau and to dealers, both through Pacific Gas and Electric Co. personnel and wholesalers' salesmen. Briefly, the PG and E will mail 1,000,000 bill stuffers inviting customers to visit participating dealers' stores. The stuffer offers a gift to those answering a few simple questions pertaining to appliances and of buying intentions. The gift is the $1 book, *Better Meals at Lower Cost,* published jointly by the bureau and utility, and which has been featured in the numerous cooking schools.

To develop sales from this, dealers participating will be urged to conduct demonstrations, make special displays, promote and feature electrical appliances. Participation financially in local promotions with units who wish to put on laundry schools, freezer schools, cooking schools, or special local advertising is promised.

The dealers handling brand names of major electrical appliances distributed by members of the Central Bureau receive the *Better Meals at Lower Cost* booklet for 10c each. Others get it for 30c per book and may participate at will. Also, many manufacturers' representatives will help dealers in their promotional efforts. The utility will run large advertising with which local dealers will be asked by their local newspapers to run tie-in ads.

The cooking schools, which began early in January, are being conducted in cooperation with *Magazine California,* an insert in many small weekly newspapers throughout northern California. The newspapers and magazine provide the auditorium and publicity. Local newspapers have sponsored the cooking schools and dealers set up displays and provide ranges for use. In some cases they provide door prizes.

The first such school was conducted at Mill Valley and handled by Marguerite Fenner, home economics director of PG and E. Scheduled in the immediate future are such schools at Atascadero, April 1, Paso Robles, April 18, Firebaugh, May 13.

The automatic clothes dryer promotion was carried on jointly by the NCEB and the Gas Appliance Society. It provided dealers throughout the area with posters and the utilities featured clothes dryers on billboards and in newspaper advertising.

In recent annual elections for the Central Bureau, W. J. Lee, Sherman Clay & Co., was unanimously re-elected president as was C. R. Mathews, Westinghouse Electric Supply, vice-president; O. R. Doerr, PG and E, secretary; Frank K. Runyan, Western Merchandise Mart, treasurer; John S. C. Ross, PG and E, chairman of the executive committee; and LeRoy H. Bennett, manager of the bureau.

The San Francisco unit elected Claude L. Stout, Hale's Appliance Stores, as president; J. J. Marshall, Easy Washing Machine Co., vice-president; and Carl P. McCarthy, secretary-treasurer.

Directorates in both the Central Bureau and each of the units are representatives of all the branches in the industry, including retail, wholesale, manufacturer and utility representation. The bureau operates in the territories of Pacific Gas and Electric Co. and Coast Counties Gas & Electric Co. from Bakersfield and Santa Maria north to the Oregon border.

● **As this went to press** Bennett announced Sept. 27 to Oct. 5 as the dates for the 1952 Exposition and Home Show in San Francisco Civic Auditorium, cosponsored by the Associated Home Builders and GAS.

Two Views of the Future

San Diego dealers warned—then stimulated to sell

Contrasting views of the appliance situation were given the 500 dealers and salesmen who attended the winter conference of the Bureau of Home Appliances of San Diego last month.

At the afternoon session, the audience was given an authoritative view of market conditions by speakers Herman N. Mangels, vice-president of Federal Reserve Board of San Francisco, and Walter Elieson of the Los Angeles regional office of the U. S. Department of Commerce. Disturbing market conditions were envisioned as Elieson stated that the demands of defense production, when they hit peak levels of metal consumption this summer, would cut into appliance production to an extent that would put supply at less than consumer demand. In the face of this shortage was the possibility of a larger supply of consumer money.

Mangels reported that "the high level of government spending will bring about an increase in the U. S. money supply during 1952 . . . under present conditions, the level of government spending and the credit demands of industry engaged in defense work will result in an increased supply of money at the same time that the NPA is ordering a cutback of civilian goods." He said that the Federal Reserve Board has attempted to curb inflation by raising discount rates to discourage bank borrowings, through increases in member bank reserve requirements and by various credit controls over durable goods, real estate and stock market transactions.

While these reports from financial authorities created a disturbing view of what the appliance retailer might expect for the second half of 1952, the pain was mitigated by the information given forth on the "manufacturers' panel."

Twelve manufacturers' representatives, invited to present the plans and programs of their companies for the balance of the year, outlined production and promotion efforts that convinced most dealers that there would be considerable selling activity for many months to come.

A representative of a washing machine concern said that the industry expected a production of 3,000,000 conventional washers in 1952, that most retail sales will continue to involve trade-ins, and that every tool of advertising and selling will be needed throughout the year.

The representative of a full-line manufacturer outlined a national advertising campaign tied in with a 3-times-weekly TV show to promote sales of electric housewares.

Another full-line manufacturer has allocated $1 million a month to advertising and promotion, his representatives announced. Another reported that his company would put extra effort during 1952 on the promotion of low-saturation white goods—dishwashers, freezers, etc.

Each representative reported that his concern already had allocated advertising and promotional funds for 1952 that would far exceed the total in 1951.

Problems at dealer level were aired during the afternoon session when the bureau presented a "dealer panel" composed of five established appliance retailers from the San Diego city and county areas. Keyed to the current local problem of "discounts," a question on what dealers could do about the discount problem, the concensus was that extra emphasis on product service and guarantee, installation and demonstration, and reputation of the dealer were the strongest forces in the hands of the non-price-cutting dealer.

In another question, dealers discussed the possibility of getting manufacturers to introduce television models by number rather than by year in order not to obsolete current stock. Mention was made of the success of the gas range industry in such presentation of models.

At the evening session, a large audience heard D. B. Tatum, Pacific Coast manager for TV, American Broadcasting Co., San Francisco, discuss the social significance of the advent and development of television. He said that it was likely that the freeze would be lifted soon, but that there would remain many problems both in procurement of transmitting equipment, and in the legal problems of assigning channels, before many more TV stations were on the air.

Opening the evening session, H. G. Dillin, vice-president in charge of sales for San Diego Gas & Electric Co., welcomed the group to the winter conference, and outlined the progress of electricity in the country during the past year.

In other presentations before the afternoon and evening sessions, Howard Scaife, Hotpoint Inc., discussed the growth of the appliance industry, and stated that an industry can't be built on "deals." He described how price wars were like any war, that the end result was destruction. He pointed out that the appliance dealers were now at the threshhold of the best selling season of the year.

Ed Reed announced that the bureau's "Spring Fair of Modern Home Ideas" would open on April 15. Al Jewell of Graybar announced the "Modern Traffic Appliance Clinic," which would begin on March 11 with a program to train dealers and salesmen on product knowledge.

In a review of the bureau's advertising and promotion campaigns, F. M. Raymond announced that $250,000 would be spent in 1952. He showed with charts how this would be allocated monthly so that dealers and distributors could tie in their sales.

Dealer Gordon Dawson, bureau president, was in charge of the winter conference, with Bureau Secretary-manager J. Clark Chamberlain coordinating the activity. (Pictures of the meeting appeared last issue, p 104.)

They Develop Sales

With a new name better fitting its operations the business development department, formerly called general sales department, of Utah Power & Light Co. gave an "Electrical View of '52" to meetings of dealers, contractors, distributors and manufacturers in the various divisions of its company during March. According to R. H. Ashworth, commercial vice-president, the new name fits the functions of the department better since the company is not in direct sales any more.

To give the trade in its area a concrete reminder of what the promotional program of the company would be for the year 1952, a brochure with the title, "Electrical View of '52," was prepared and distributed following the meetings. President G. M. Gadsby, Vice-President R. H. Ashworth and W. A. Huckins, manager of the business development department, prefaced the booklet with their views of the market possibilities and opportunities, power supply situation, etc., in the area. Then followed individual presentations.

ELECTRICAL WEST Sales Guide

News Letter

April 1952

FOR THE ELECTRICAL MERCHANT OF THE WEST

Odd, isn't it, how an idea like the food plan suddenly begins to click and then everybody tries to get in the act. The sales appeals—food savings and convenience—have always been advanced by the manufacturers of home freezers as result getters. But packaged with a "buy it wholesale" appeal on food, especially meat, and sold on terms, and the public buys a freezer at higher than list price usually in order to make some theoretical savings on food. But retail butchers and grocers do not like back-door selling at wholesale any better than appliance dealers seem to on appliances, so a battle is on. Food plan operators with crews of high-power door-to-door men seem to be cleaning up. Now all the freezer manufacturers want dealers to go into a plan of their own. It goes to show that door-to-door selling is still the way to sell major appliances.

Food for thought

With the general tone of appliance business none too brisk it is natural that a gimmick like the food plan, which moved a lot of freezers, would be considered a new bonanza. Seems to have started in Los Angeles and New York, now flourishes in San Francisco and Seattle and Salt Lake areas and is spreading eastward. There are said to be over 100 plans in California. The grocers have asked the Better Business Bureaus to condemn; the OPS has been drawn in. In Los Angeles there is even an "Approved Freezer-Food Plans Assn." drawing up a code of ethics. It would have all stop claiming to offer free freezers, wholesale food ads, pirating of TV and radio spots, telling what salesmen are paid. Newspaper publishers are asked by BBB to watch ads for false claims also. Department stores and big chains are developing plans of their own. The situation is still in flux. Los Angeles Electric League held a hot meeting on the problems involved.

Also fuel for fire

A compact little pocket-sized book to tell any dealer all about the way to set up a food plan of his own—what it is, why it is popular, how to finance, what to do, how to advertise, how to get salesmen, etc.—is about to be published by Harnish & Reid, Western Merchandise Mart, San Francisco, and sold for $2.50.

Roll your own plan

Both the McGuire and Keogh bills to restore Fair Trade adherence were reported out of committees but not with enough support to insure an easy passage. Indeed if President Truman vetos them—he is opposed to Fair Trade—they would not survive. Representative Celler of N. Y. who fought them in committee has substituted an anti-loss-leader bill. . . . San Francisco Pot & Kettle Club will hold a special night meeting April 16 to hear a debate on "Fair Trade or What?"

Fair or what?

Builders tear down

Seattle Appliance & Music Assn. is girding to tackle the builder-contractor problem. A committee headed by Keith Davis was appointed by Tom Carmichael, SAMA president, after the directors sized up the problem and checked off what builders were doing in the way of appliance buying direct. The April 8 meeting of the association features it.

Valley show

Sacramento Electrical Home Show dates, May 23-25 at the Memorial Auditorium, have been set by the Sacramento Valley Electric League, which is running the event itself. Primarily electrical it will have some exhibitors of other home equipment and accessories. Admission of 50¢ will be charged, 25¢ with tickets dealers will give away. Prizes and entertainment are drawing cards.

Combined home show

1952 combined electrical exposition and home show, to be sponsored jointly by the Northern California Electrical Bureau, Associated Home Builders of S. F and Gas Appliance Society, will be at San Francisco Civic Auditorium from Sept. 27 to Oct. 5, LeRoy H. Bennett, NCEB manager announced. Sunset magazine is designing the home show features.

Running start

In Spokane the Inland Empire Electrical League got off to its new start at a big March 5 meeting and since then a big dinner meeting of distributors and salesmen at the New Ridpath was to be held April 11 and a sales training program is to be started in May. A supply and apparatus section has plans for a commercial air conditioning promotion in June. Dan Peterson has been appointed full-time assistant secretary of the League to Bob Wilkinson, who splits his time being manager of the League and of the Spokane Chapter of NECA. See story next issue.

Service grows

Los Angeles Electric League is being asked to form a service division by George Korntved of Service Inc., chairman of the retail service committee. The League has held some hot meetings over freezer plans, television promotions and residential lighting. Los Angeles Dept. of Water & Power plans to spend $140,000 in promotional advertising this year, Robert Cockfield told the League recently.

Indicted

An association of radio and electronics parts distributors in San Francisco is in trouble. A Federal Grand Jury has indicted it, charging violation of antitrust laws and monopoly of the parts supply, etc.

Winners

At least two western utility companies received awards at the Edison Electric Institute 18th annual sales conference, March 31-April 3 in Chicago. Southern California Edison Co. won the George A. Hughes Award by Hotpoint for electric kitchen promotion and results. Utah Power & Light won the George Westinghouse award in the electric washer promotion division.

Spring is here

Spring Fair of Modern Home Ideas by the San Diego Bureau of Home Appliances is lined up to open April 15 at the Electric building, Balboa Park, and run to April 20, admission free, to a potential 150,000 people. Exhibits will include practically every make of appliance and TV, eight makes of kitchens. The locker plant association will demonstrate meat cutting and processing. Frozen food products will be shown. The electrical contractor division will have one building exhibiting wiring, lighting, heating, ventilation and sound equipment for homes.

Pump up other sales

Among sales builders being offered by Edison Electric Institute is a new electric water systems promotion assisted by the pump manufacturers. With a water system the farm home can then be sold a water heater, washer, dryer, disposal, dishwasher, milk cooler, poultry and stock waterers, irrigation systems, sterilizers.

Current Plugs, the regular monthly report of appliance sales by dealers in the Pacific Power & Light Co. territory, discontinued temporarily during power shortage times, is back again. With it dealers can measure their own selling against the totals reported by Guy Davis.

Plugged back in

Television sales were still slow but with the political campaigns warming up sales are expected to do likewise. Meanwhile FCC is still getting ready to unfreeze more channels, 70 in UHF and more on the 13 bands of VHF, but it will take months of hearings before more stations are started. Best estimate now is that maybe 20 new stations may get on the air in 1952, 50 more by mid-1953. . . . Camco Enterprises of San Mateo has a scheme to erect a master TV antenna above the 7,000 ft level in the Sierra, pick up S. F. stations, pipe them to Reno via coaxial cable to subscribers at about $25 a month, $75 for installation, leasing the sets. Telemeter Co. has similar plan for Palm Springs but using coin meters. Would use eighth channel to pipe local theater programs for coins in the meter.

TV in the news

Biggest beef of the month came from big ads and mail-order selling of "TV Owners Guide," written by James Conto, head of a TV service agency, of which some 250,000 copies already have been sold. Ads infer that dealer service organizations are often crooked, incompetent, charge too much and that any man with a screw driver can repair his own set with the book's directions. NARDA and service associations have protested to Federal Trade Commission against false advertising.

Home repair?

Prices took a tumble as many manufacturers announced new models. Some absorb warranty charges and excise. A few days after Emerson's president, Abrams, told distributor meetings that he had a 17-in. mahogany veneer table model to list at $179.95, "the lowest in the industry," John Meck opened a chain of Scott company-owned stores with 20-in. table models for $99.95, which was $150 off retail list. Motorola prices started at $199.95 for a 17-in. table model. Even conservative Magnavox dropped from $19 to $75 off its prices, the lowest number being a 20-in. console at $298.50, a 17-in. table model at $229.50. Hoffman announced a new policy of covering the cost of receiver, warranty and federal excise in the list price. Admiral did the same. . . . Newest gimmick from New York, where else, is to advertise to pay consumers $1 a week to "store" TV sets for them until they can find more warehouse space, with the privilege of using the set for those few days.

Another notch

In the musical chairs tradition of radio-TV the following changes were reported last month: Ray Thomas Co., Los Angeles, now has the CBS-Columbia line of radio and TV. Used to have Capehart. . . . Kaye-Halbert Corp. of Culver City appointed Wholesale Radio & Electric Supply of San Francisco; San Jose Television Supply Co., as distributors. . . John Nicolay, recently Dalco Appliances sales manager in Sacramento, ha: gone back to Thompson-Holmes as northern California manger of the Capehart and appliance division of T-H. . . . Sparton Radio-TV has formed a southern California sales district, including San Diego, Orange and Imperial counties and W. R. Brittle of Long Beach heads it. . . . Fabian Bolte, former West Coast service engineer for Bendix Radio, has joined Mercury TV Corp., Los Angeles, as national sales representative. . . . Roy Kertson, former Wood & Gies San Diego branch manager, is now Tele-King Distributing Co. of San Diego manager. John Meiner is its service manager. . . . Lewis E. Pett was made Western district manager for the television transmitter division of DuMont Laboratories. Though headquarters are in Clifton, N. J., he will have offices in San Francisco, Los Angeles and Dallas.

This is "flux"

Short shorts

Quickies about manufacturers: Admiral may go into making home freezers this fall. . . . Nesco has bought Fleck Inc., maker of the infrared broiler. . . . Whirlpool Corp., maker of its own and Sears' Kenmore washers, said to be the world's largest washer maker, merged with Clyde Porcelain Steel Corp., makers of component parts. The merger is to increase Whirlpool capacity and it plans to re-enter by summer markets it withdrew from last year due to material shortages. . . . Westinghouse has upped prices of its housewares but not bed coverings.

About people too

Among people in the appliance trade: Arthur Marvon, San Francisco Mart, has taken on the Belmont line made by Raytheon. . . . Milton Meyerfeld has been named radio and TV sales manager of Dalco; Randy Christman to be peninsula appliance man. . . . Schley E. Calmer, former Hoover Co. district manager in Los Angeles, now heads branch sales for southern California, southern Nevada and Arizona; James Lynch, former district manager, Los Angeles, now branch manager at San Francisco. (Hoover, by the way, will sell its reconstructed cleaners through distributors.) . . . J. J. Luckanish & Co. now has Fred Smiley, former Dalco man, in the Fresno territory on Gibson and Dexter; Pat Meeks on the north coast from Sausalito to Oregon. . . . Ray Cox has been made president of Herbert H. Horn Inc., Los Angeles, Admiral distributor, and Horn moves up to chairman of the board and retires from active management. The firm is to build a new million dollar building at Washington and Garfield. . . . Terrance Allen Jr. was made regional sales manager for Boyd Distributing Co., Denver. His predecessor, W. J. Lujan, is now president of Allied Distributors of Denver, which now has Admiral line, formerly handled by Marcus Bros. Ray Thomas Co., L. A., named Norman Goodwin, formerly with Decca, its Columbia records manager. . . . Gordon Wilkins-Ironers Inc. named Ernest Miehle director of sales, Los Angeles. . . . Kaemper-Barrett, San Francisco, appointed E. F. Davis sales manager for major appliances. He had been credit manager. Preston Cherry, former appliance manager, becomes regional manager for Amana Refrigeration Inc. . . . Philco-Los Angeles appointed Leonard Kercheval Jr. sales manager, appliance division.

Change lines

Phil Gough who eased out of the changed Philco distributorship in southern California has signed with R. H. Burnside of International Harvester Co. to handle that line. It was formerly carried by Thomas Distributing Co. Gough Industries has houses in Bakersfield, Long Beach, San Bernardino, San Diego, Santa Barbara and headquarters in Los Angeles. Gough recently took over Sylvania TV from Graybar and Speed Queen from Sues, Young & Brown in big shift of distributorships.

Lineup changes

With the move of the Norge line from Meyberg Co. to Thompson-Holmes in San Francisco a number of changes in staff occurred at Thompson-Holmes, Caleb Sharrah, president, announced. Bob Coleman, former Meyberg promotion manager became T-H promotion manager. Melvin Pettis was made sales manager of the Norge sales division. John Nicolay returned to T-H from Dalco at Sacramento to be sales manager for the Capehart and appliance division. A series of open houses to show the new Norge automatic washer and the entire line was scheduled in April.

Promoted

Jackson Hoagland, adequate wiring specialist of Arizona Public Service Co., becomes the new sales promotion and advertising manager there as A. W. "Bert" Smith moves up to the sales staff of Ebasco Services in New York City. Hoagland was former editor of mining papers and advertising manager of a Phoenix newspaper.

New

Blackstone Corp. has appointed Kimball Distributing Co. in Salt Lake City. Formerly the line was handled by Western Gas Appliances Inc.

APPLIANCE PREVIEW

Cycla-matic Refrigerator

(1) Frigidaire Division, General Motors Corp., 200 Taylor St., Dayton 10, Ohio

This refrigerator-freezer combination features Levelcold temperatures, claimed to remain constant regardless of season or weather. The food freezer is a separate, completely insulated compartment, without defrosting heating devices.

Refrig-O-Plate defrosting is claimed to get rid of frost in the box before it collects. It attracts excess moisture and eliminates frost as soon as it appears; has no clocks, timers, counters or heaters.

Shelves have nylon rollers and come out full length, silently. Shelves are extra strong and are made of rustproof aluminum. A sliding utility tray, with an adjustable section divider, provides space for storing small items.

Jet 99 Cleaner

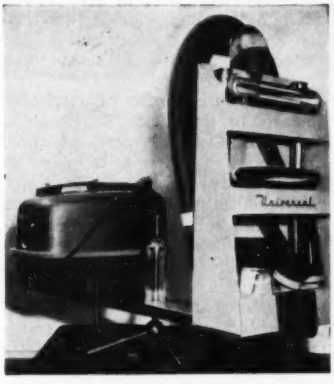
(2) Landers, Frary & Clark, New Britain, Conn.

The Universal Jet 99, shown on its whirlaway dealer display, has a motor with approximately 1 hp capacity; suction of ½ million cu in. air per minute; rug nozzle with floating brush designed to pick up threads, lint, etc., and to give maximum contact suction from one end of nozzle to the other without clinging to rug.

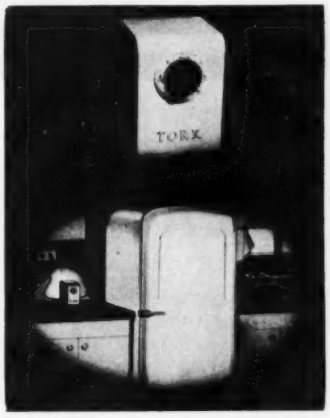
Dirt is emptied by pressing a small button on top of cleaner, lifting lid and tossing paper filter bag out.

The cleaner is balanced to glide and pivot as it is turned, and will not slip off stair treads, according to the manufacturer. It weighs 18 lb; is 12⅜ in. high, 10⅜ in. wide. It comes with a detachable, extra-length cord.

Attachments include oval brush with heavy-duty bristles, round brush with soft bristles; upholstery nozzle with floating brush; crevice tool; spray gun; demother.



(3) **CLOSET LIGHT**—A new automatic model is designed for easy attachment to door frame of closet, cabinet or stairway; is prewired. Made by Monowatt department of G-E, Providence 7, R. I.



Defroster

(4) Tork Clock Co., Mount Vernon, N. Y.

This defroster has a Telechron synchronized motor that is self-starting, with switch of beryllium copper blades and heavy silver contacts. The case is of baked white enamel and measures 4½x3x3. The receptacle into which the refrigerator is plugged and the cord and plug for the wall outlet are Underwriters' approved. Dial is easy to read.

The unit has a preset defrost period and can take care of a box up to 15 ft. It can be hung on a wall or placed on a flat surface.

ELECTRICAL WEST ***Not good***
68 Post St., San Francisco 4, Calif. ***After June 1***

Please send me, without obligation, more information on the appliances described on this page and identified by numbers circled below:

1 2 3 4

NAME ..... **TITLE** .....

COMPANY* .....

ADDRESS .....

CITY ..... **STATE** .....

*** Please include your company's name and your position, since we cannot ask manufacturers to furnish literature unless you do.**

Sherwin Moody Adams Hansen Howe Bishop

PCEA's E & O Conference is Big Success

Supported by an attendance of 406 and provided with a heavy and meaty program, the day and a half conference of the engineering and operating section of the Pacific Coast Electrical Assn. held at Fresno, Calif., March 20-21, goes down as one of the most successful group meetings of the section held in years. A special effort had been put forth to make the parallel meetings the discussion or round-table type and to hold prepared papers to a minimum. The plan worked well and there was a gratifying number of questions and amount of discussion from the floor. A resume of the meetings of the several groups follows.

Communication Group

G. E. Bishop, Sponsor

It is probable that there will be some regulations of the use of carrier current on power lines, although it is believed that FPC document No. 9288 now under consideration will be modified, since its enforcement would not permit the use of much of the present equipment that is valued at many millions of dollars. There seems to be little need of FCC regulation since self-regulation has proved practical in the past.

"In-band repeaters" have little application for the Pacific Coast utilities. It is generally believed that the limited number of frequencies available can be better utilized in simplex systems.

Applications for radio transmitter construction permits and operating licenses have been simplified and the height limitations on antennas clarified by the Federal Communications Commission. The new forms are now available.

Mobile - to - mobile communication requires that the mobile operators obtain permission from the base station for such communication or that they hold operator's license, based on the FCC rules Parts 1 and 2 rather than Part 11.

Although the number of telephones operated by the Pacific Telephone & Telegraph Co. has increased three times and toll-circuit mileage 30 times since 1915, they are able to provide facilities required by the utilities with more reliability than ever before.

One utility has developed and is trying a scheme of land line telephone protection that will avoid the difficulty of blown fuses at times of transmission line trouble.

The use of frequency shift and frequency modulation on power line and telephone line carrier equipment has proved advantageous in operation, in that low power without bypassing can be used. The crystal control frequency shift method is used to trip breakers for out-of-step conditions and will trip on the first cycle.

In the application of power line carrier channels, channel attenuation, line noise, receiver susceptibility and transmitter power must be considered when deciding what equipment to use for a carrier channel. Channel attenuation is affected by line length. Line noise can make a carrier channel unworkable. The choice of receivers is determined by the usage and the type of transmission employed. The maximum ratio of noise to signal that can be tolerated determines the power of the transmitter. All of these factors must be considered when designing power line carrier equipment.

Microwave systems, because of their low cost per circuit mile per year, are being used more extensively than ever but, because of their line of sight requirements, careful tests must be made of any proposed installations before the equipment is installed, to insure proper operation. It is preferable actually to sight through with a telescope to determine that the path is clear, rather than to depend on topographic maps.

Actual cost studies of the use of mobile radio equipment have shown that in general the cost of the equipment will be saved in approximately one year.

Tests on the 450-megacycle band have shown that there are many advantages in the use of this frequency in urban areas. Some manufacturers now have equipment available that will operate at this frequency.

Engineering Design Group

F. S. Benson, Sponsor

Discussing repetitive-duty cycles of starting large induction motors across the line, E. F. Kaprielian, PG and E, pointed out that a motor's life may be divided into two classes, its start-up life and its normal operating life. During the start-up period, trip-out tests may require from two to five starts a day for boiler feed pump motors and from two to three starts a day for boiler fan motors. During the normal operating period, these motors are started only one to two times a week.

Results of tests made cooperatively by PG and E and General Electric on a 2,000-hp boiler fan motor were reported. Jerry Green, G-E, stated that the motor starting tests made at Kern steam plant provided the manufacturers with certain factual and necessary data. He cautioned that all motors do not necessarily have the same ther-

Angell Blink

Longley Lawson

Schentzel Black

mal capacity, therefore the data gathered may not apply to other types of motors. He stated that motor bracing was not a problem but that stator winding and end-turn bracing are real problems. He described new insulations and new end-turn bracing designs.

A synchronous generator operating at leading power factor can do two important things, stated Dr. A. Tilles, PG and E, in discussing the operation of large steam turbines at leading power factors. The first is to buck voltage and the second to produce and push out rated kw into the system. These properties are important when a system is lightly loaded. He showed that the steady state and transient stability limits of a system are not impaired by leading power factor operations.

W. Ridgway, General Electric, said that generator heating is caused by operating in the underexcited region, which increases the leakage flux in the end-turn winding. He referred to tests on one of the Moss Landing generators and said that increasing the hydrogen pressure has the property of reducing injurious end-turn heating. He recommended the addition of thermocouples in the end-turn package, which can be connected to a recorder. Kaprielian discussed the Moss Landing generator tests. Conclusions reached from these tests were: underexcited operation requires the use of a rotating amplifier; second, excessive end-turn heating is limited to a few locations in the end-turn package, and thermocouples and a recording temperature meter is recommended; third, increasing hydrogen pressure from ½ psi to 15 psi decreased the heating by 15%; fourth, a decrease of 10% in kva reduces the heating by 20%; fifth, a conservative temperature rise when operating at rated kva, rated voltage and 95% leading power factor was indicated.

The trend in lighting steam plant control rooms with fluorescent lighting and luminous ceilings was described by E. Nilsson, PG and E. He said that changing switchboard colors from black to cream or pearl grey was a step in the right direction. Internal instrument lighting is also a forward step. Brightness contrast ratio between different parts of the switchboards should not exceed three, he stated. This ratio is greatly exceeded on present-day panels. Another point was that brightness of the lighting fixtures on luminous ceilings should not exceed 200 ft-lamberts.

Spear Hathaway

Kamphausen Wheeler

Further discussion was given by Ken Knopf, Betchel Corp. He stated that there are three seeing tasks required of control operators: first, day-in-day-out seeing tasks that require good general illumination and the removal of all glare sources; second, light for reading the instruments with good degree of readability and absence of reflected light sources; third, a design of lighting that will enable the operator to take mental pictures rapidly. To accomplish this, the usual control room lighting must be drastically changed. The vertical surface lighting must be twice as great as the horizontal surface lighting, he said.

Heat Balance

Heat balance requirements for the new Etiwanda steam plant of Southern California Edison Co. were discussed by J. B. Moore of that company. Gain in heat rate studies were presented, which showed that at a fuel cost of 28c per million Btu the economical reheat cycle was chosen as 1,800 psi 1,000°/1,000° steam. The addition of an evaporator condenser gave a gain in heat rate and was thus justified. He stated the present design of Etiwanda steam plant when burning oil will give a heat rate of 9,450 Btu per kwh, which is excellent for a cooling tower plant.

W. Nutting, PG and E, further discussed the subject, stating that factors to be taken into consideration were: estimated capacity factor over the useful life of the plant, the expected cost of fuel during its life, the location of the plant with the load, the location of the plant with regard to transmission, location with respect to cooling water, its proposed efficiency with regard to hydroelectric plants and older steam plants. He said Btu in heat rates may be evaluated by assuming a 60% capacity factor, fuel oil cost at $1.75 per bbl, capitalized at 12%. A Btu saved is worth $1,200 in first cost. He then briefly discussed features of three PG and E steam plants now under construction.

R. A. Bowman, Bechtel Corp., stated that heat rate studies are implemented by preliminary piping diagram layouts including valves, pipes and major equipment. Such diagrams are first drawn on separate sheets. The preliminary diagrams are large and are made to be changed readily.

Tracy Courtright Best Moats Rosch Borda

They include fuel piping, condensate piping, boiler feed water, circulating water and steam piping for turbine control. He said this scheme was borrowed from refinery people who used it with great success to perfect their process studies.

Auxiliary Power Systems

The reliability of the auxiliary power system in a steam plant must equal or be better than the mechanical design, stated H. C. Austin, Southern California Edison Co. In his opinion, designers should be allowed freedom from too much pressure from the operating group, as the latter often insist on much duplication of equipment to provide an estimated maximum reliability and continuity of service. He then discussed various methods of auxiliary power supply. He said that Edison company frequency tests showed that they lose their auxiliary power motors when the frequency drops 10%, which gives 54 cycles as the lower limit. In the new Etiwanda steam plant there will be a shaft-driven house generator with a stand-by power source from the 66-kv system.

M. L. Lewis, Bechtel Corp., stated that the basic requirement for auxiliary power is to provide a reliable system, which is coordinated with the system as a whole. He then discussed the many factors to be taken into consideration in auxiliary power supply. It was pointed out that a primary selective system was used for the 460-v auxiliary power supply at the new Gadsby plant in Utah. He has found that 2,400-v auxiliary power equipment is often more economical than a 4,160-v source. He said more consideration might be given to a complete 460-v system, eliminating the 2,300-v and 4,160-v systems.

In a paper prepared by J. F. Sinnot, San Diego Gas & Electric Co., he emphasized the importance of reliability and continuity in auxiliary power supply and said that to attempt to guard against all contingencies is not economical. Therefore, a compromise must be made by the engineer and the operating man. Auxiliary power supply at his company's steam plants were described.

Hot Spots in Steel Members

Excessive temperatures produced in small localized areas on metal-enclosed current-limiting reactors, segregated bus duct and isolated-phase bus duct were discussed by Nilsson. He said that usually current values of 2,000 amp and above produce hot-spot temperatures in steel members or plates within a distance of one foot. Temperature rise of such metals must be guarded against as at 900 F steel begins to lose strength, he said. At 400 F paint blisters, and at 200 F personnel may burn themselves if they come in contact with hot bodies. He showed a copper current-carrying conductor enclosed in an aluminum or copper enclosure. The enclosure reduces the field flux value to one-tenth of its value without the metallic shield. He showed also that copper short-circuiting rings or bands placed around a steel beam or column near a heavy current-carrying conductor satisfactorily reduces the heating of the steel member, provided the area of the short-circuiting ring is 30% of the main copper conductor.

J. McKeen, Bechtel Corp., gave a blackboard analysis of the various methods of controlling the field flux from heavy currents to prevent the formation of hot spots in adjacent steel members.

Outdoor Generating Plants

The gradual change of equipment from indoor to outdoor area, such as electrical buses, both high and low voltage, synchronous condensers and finally boilers and turbine generators, was reviewed by Ben Schmid, PG and E. One of the most important reasons for outdoor plants is the saving in cost, he said. Some say $10 per kw may be saved, others say the savings are marginal. However, he pointed out, the industry trend is toward outdoor plants. All agree, however, that the control or operating rooms should be completely indoors.

I. R. Caraco, Bechtel Corp., pointed out that many designs of outdoor plants are using the unit system. Some companies are scheduling plant shutdowns every two years, which makes outdoor plants more attractive. He said that the fundamental consideration for the design of outdoor plants is first, economy in first cost; second, proper working conditions for the working personnel. He showed a number of slides of outdoor plant design and construction by his company.

E. Gothberg, PG and E, stated that operating chiefs are mindful of the number of operating personnel for modern plants. The use of combination operators handling both control and equipment has great advantage. To satisfactorily use such a combination, men and certain equipment areas as well as the control room must be housed. He said that outdoor plants require a compromise between requirements of operation and the requirements of economical design. Massive buildings over the turbine area are an advantage that can be eliminated, he said, but the vital plant equipment must be enclosed or housed.

Hydro Generation

F. I. Lawson, Sponsor

The hydrogeneration group directed its attention to several current developments in the hydraulic turbine field and reviewed practices with respect to the maintenance and rehabilitation of existing units.

Lewis Ridgway

Savage Benson

Davis Williams

The growing use of multijet vertical impulse turbines was ably presented in two papers. One was given by I. Morgan White, manager of engineering for Pelton Water Wheel Co. He outlined the factors involved in the design of such units, which have resulted in important gains in efficiency, compactness and increased size of units. After pointing out why earlier pioneer-day ventures in this direction had failed, he briefly reviewed the newer developments in bucket design, wheel settings, and the relation of these items to the six-jet 62,000-hp 1,118-ft head units installed in 1950 at Bridge River, Can., and the four-jet 140,000-hp 2,500-ft head units now being designed for the Aluminum Co. of Canada.

D. P. Dinapoli, PG and E, then described the interesting installation being made at Salt Springs power house on the upper Mokelumne River, of a three-jet 40,000-hp 1,960-ft head unit wherein several of the features of the multijet vertical type of unit have worked out to distinct advantage.

In the modernization of its Big Creek and other plants, growing in part out of the conversion from 50- to 60-cycle operation, Southern California Edison engineers utilized a number of improvements in both impulse and reaction turbines that have been accruing through the years since the initial installations were made. T. C. Stewart gave an excellent resume of this work on a total of 49 units that accented the variety of problems met. In most instances distinct gains in efficiency and improved operation have been obtained, though in one or two cases expected results did not materialize, indicating that there still are unknown factors in the field of turbine design.

Another new development to come before the conference was the application of a type of hydraulic speed sensing element to hydraulic turbine governors. Byron L. Wheeler, Pelton Water Wheel Co.'s governor department, described the manner in which that company is applying the Westinghouse steam turbine cup valve to provide a simplified and improved governor for hydraulic turbines. He reported upon a background of experience with two such governors in service and three others about to go into operation, and showed test results indicating high sensitivity and other derisable characteristics of these units.

Turbine maintenance practices with respect to bucket repair, restoration of wearing parts in reaction turbines, and lubrication practices, all came in for considerable round-table discussion. Valuable contributions came from A. J. Deskin and H. L. Wheeler, Southern California Edison; M. A. Erskine, PG and E; Paul Yelton, California Electric Power Co.; and M. M. Bridgewater of the Northern Arizona Light & Power Co. Inquiry was made as to a practical method of revealing the development of fatigue cracks in main shafts, there having been two such failures in recent years in California. No suitable solution was offered.

Current practices in the application of penstock valves, headworks and tailrace gate also came in for discussion under the leadership of J. T. Corwin, PG and E.

G. L. Hill, PG and E, gave a comprehensive review of his extensive explorations in the field of insulation tests made under his direction on generators and synchronous condensers of varying ages, using electronically generated high-voltage direct-current measurements as the criteria for determining the condition of the windings. His results in this important field have excited a great deal of interest and brought forth a considerable amount of lively discussion.

Meter Group

M. A. Fredrickson, Sponsor

Respective chairmen M. H. Bowman, H. W. Bruce and E. W. Trenkle of the Western Utilities Electric Service Standardization Committee and the California and Arizona groups of the Pacific Utilities Electric Service Requirements Coordinating Committee reported on the many electrical service requirements that have been standardized and are now in use by the member utilities. Substantial savings are being realized by customers, contractors and utilities.

F. A. Redding, national chairman of the meter and service committee, EEI, outlined the activities of this organization and stressed the need for greater participation by our Pacific Coast utilities in the surveys and standardization work carried on by the national group.

The possibilities of a testing program as a supplement to interviews, written reports and supervisors' opinions in establishing qualification for hiring and promotion was developed by H. E. Naegeli, Southern California Edison. Sample tests used by the Edison company to obtain information about intelligence, personality, aptitude and job knowledge were described. The need for completely objective tests that minimize the chances for differences in interpretation and evaluation has led to the wide use of the mathematical problem, the "draw-in" diagram and the multiple choice question. The use of tests have proved very satisfactory to both management and personnel.

Training Meter Personnel

Discussion leaders: H. D. Noren, Coast Counties Gas & Electric Co.; R. C. Seagren, PG and E.

The inability of utilities to attract adequately educated personnel is forcing job training programs to recognize the need for schooling in fundamentals such as mathematics, electrical theory, etc. Good results were reported by several utilities for a training program incorporated in their labor union agreements. Successful participation in the company-sponsored educational program is a requirement for advancement. Most deficiencies in on-the-job training can be eliminated if supervisors are made to accept and properly discharge their full responsibilities. The PCEA meter group will compile a list of visual aids for training metermen.

Customer Relations and Interdepartmental Relations

Discussion leader: R. V. Jones, PG and E.

A report was made on the highly successful use of the meterman by one utility as a key customer relations man who handled all customer contact in connection with meter tests and complaints. Some doubt was evident in the discussion that all of these prerogatives should be assigned to testmen, but it was agreed that they should be trained to answer general questions about the company, and to know when and where to refer questions beyond their scope.

The test department, in its many contacts with other departments, should be progressive in selling its ideas and opening up opportunities for test personnel in other fields.

Services to Low Height Houses

Discussion leader: E. B. Kipp, San Diego Gas & Electric Co.

The present trend to low house roofs has led to the need for a mast or structure to give the service drop adequate clearance above ground. As illustrated by slides, many of the present service attachment structures do not meet the requirements of adequate strength, long life, low cost and acceptable appearance. In this national problem involving the customer, contractor, inspector and utility, we should work together on a program that includes: Customer responsibility for installation and maintenance; recommendation of designs by the utility; standardization of utilities requirements; cooperation of inspectors in enforcement.

Rotating Standards—Calibration and Maintenance

Discussion leaders: N. M. Albert, PG and E; W. A. Erskine, Edison.

Experience has proved that testmeters can be properly maintained by means of a laboratory calibration check every three to four months. Complete overhaul can be based on calibration and friction checks rather than specific periods of time. One centralized utility prefers to make short calibration checks biweekly.

Maintenance of extreme accuracy can be justified for standards used in checking interchange or large industrial metering but consideration must be given to wider limits for testmeters used only for general testing.

When the interrange accuracy of a testmeter has been established, it is not necessary to make a complete calibration of all ranges during each test.

Meter Markings and Essential Meter Records

Discussion leaders: G. E. Link, Southern California Edison Co.; A. J. Crowley, California Electric Power Co.

The development of a standard identification marking for watt-hour meters during manufacture that would eliminate the need for the application of codes or numbers by the utility was explored. It was concluded that at present the requirements of a universally acceptable marking would be very difficult.

Methods currently employed in meter record keeping were reviewed and possible simplifications discussed. It was the general opinion that a shift of certain record work to other departments, while feasible, would in most instances result in serious decentralization of information and considerable increases in costs.

In a special report by E. B. Kipp, San Diego Gas & Electric Co., he said that accelerated tests have shown that the use of silicone grease in the top bearings of older type watt-hour meters has successfully eliminated noise.

Overhead T and D Group

W. A. Howe, Sponsor

Practical considerations involved in cutting over distribution circuits from 4 kv to 12 kv were dealt with in some detail by T. A. Bettersworth and Howard P. Braun, both of PG and E. Both speakers emphasized the importance of careful advance planning and job organization to save time, expense, and avoid confusion in cutover work. A number of suggestions were made, such as having 12-kv transformers in place before cutover starts, changing crossarms where that is necessary on a rotation basis, using arms that have been framed in advance, using loop feeds wherever possible so that cutover work can be done in sections with less customer outage, cutting over areas experiencing the greater load growths before all of the 4-kv disadvantages become acute. Economic salvage and reuse of 4-kv equipment has not developed into a major problem so far with PG and E. Some of it is usually ready to be scrapped and the remainder can be reused in those areas where 4-kv distribution is to be retained. The speakers reported that customers are generally cooperative in these cutovers when given advance notice and the reason for disruption of service.

Economics of Aluminum Conductors

Problems of using aluminum conductors on distribution lines were frankly discussed by W. C. Lynch, Aluminum Co. of America. He said that the principle ones in connection with the use of aluminum in distribution lines are in connection with proper make-up of joints and the use of suitable connectors. Manufacturers, he said, are developing suitable accessories so that these will no longer be problems. Like many other difficulties that have been encountered in the electrical industry, those in connection with aluminum will be surmounted and satisfactorily solved by the combined effort of suppliers and the utilities, he feels. Lynch had interesting comments to make concerning the use of aluminum building wire in his company's new building in Pittsburgh. He said they had run into problems in connection with the use of aluminum for this class of work, but that these were all being satisfactorily resolved.

Series Capacitors

Use of series capacitors on distribution circuits and their protection and the economics of pole-top regulators were discussed by C. J. Nevitt, San Diego Gas & Electric Co. He said their first use of series capacitors was made on rural lines in 1946 and that it had proved to be an effective means of extending the power limits of existing circuits by providing instantaneous regulation and eliminating flicker. He said effective protection can be provided by a simple type of homemade spark gap having low maintenance cost. On the subject of pole-top regulators, he said they had been a means of keeping feeders in

dense areas equally loaded and of eliminating feeder regulators when used with transformers with ratio control. In addition, pole top regulators have been used for small loads beyond the capabilities of bus regulators.

Pole Treatment

A thorough and interesting coverage of the types and effects of damages resulting from insects and rot that reduce pole life was given by F. B. Doolittle, Southern California Edison Co. He showed what can be accomplished by systematic inspection and preservative treatment of poles and evaluated the economics of inspection and treatment by plotting costs against extended pole life. The subject was further dealt with by Dan Kamphausen, the Dan Kamphausen Co., Denver. He showed a very interesting colored motion picture of aboveground line treatment with the Osmoplastic process. His company provides an inspection and ground line treatment of standing poles by trained crews under contract with the utilities. The ground line treatment extends the service life of a pole effectively for ten years, after which time another inspection and treatment is given. The cost is less than 4% of replacement cost, thereby affording large savings. The aboveground line treatment will extend the service life of a pole consecutively for 25 years. When inspection and treatment are used together, pole life can be extended indefinitely at a cost of about $1.20 per pole a year. To date, over three million standing poles throughout the country have been treated by the Osmoplastic method. Recently a new service has been added—that of treating the tops of standing poles to kill termites and prevent dry rot. Discussion and the number of questions asked by the group indicated great interest on the subject of pole treatment as presented by Doolittle and Kamphausen.

Insulator Washing

This subject was presented by G. R. Geering, PG and E. He used numerous slides to show the various equipment that has been developed and put into practical use in washing insulators on hot lines. Geering gave a number of case histories, pointing out that some types of contamination react suitably to washing with high-pressure water, whereas others necessitate the more expensive process of cleaning by hand. Some types of contamination from industrial plants have required extensive changes and the addition of more effective air cleaning facilities on the part of the industries involved, he said.

A blackboard discussion on the subject of ground fault protection on ungrounded distribution lines and on grounded systems having very high fault resistance in dry areas was presented by J. V. Kresser, Westinghouse. He showed by elementary diagrams a number of methods used by utility companies in this area that are proving to be effective, within certain limits, in providing the desired protection. He pointed out the uncertainties that might be encountered for each of the schemes discussed. He indicated also that new relays will soon be available, which undoubtedly will surmount some of the inadequacies encountered in the past.

Distribution Transformer Loading

The subject of transformer loading as affected by high ambient temperatures proved of such interest that it accounted for an hour and three-quarters time. Although this is an old subject, it apparently commands a great deal of study throughout this area, judging from the number of engineers who entered into the discussion from the floor and appeared to be persistent in their efforts to find more satisfactory solutions to their problems.

Steam Generation Group
C. L. Hathaway, Sponsor

The discussion of control of corrosion in steam and feed-water systems was opened by three short talks by representatives of companies who supply consultation and materials for this type of work. They were J. T. Nicholson of the National Aluminate Corp.; A. R. Guenther, Dearborn Chemical Co.; and E. R. Lang, Hall Laboratories Inc. A theoretical study of the various problems involved was presented and recommendations were made concerning the use of chemicals for prevention of corrosion. The use of ammonia was discouraged in view of its action on copper and copper alloys. Instances were cited where amines were used with success in preventing corrosion by CO_2. Use of catalyzed sulphites was recommended in one instance but it was pointed out later that the action of noncatalyzed sulphite was sufficiently rapid at temperatures above 186 F so that time delay is negligible. It was stated that magnetic iron oxide is not a true measure of the amount of corrosion in boilers and that most of it is carried in from the preboiler system.

Following the introductory talks, J. S. Jensen, Southern California Edison, related the experiences of his company with the use of cyclohexylamine at its two steam plants. M. L. Crater of the City of Glendale told of their experience with the slug feeding of cyclohexylamine. In both instances improved operation resulted. E. G. Gothberg, PG and E, stated that they were not using material of this kind. H. G. Thielscher, Combustion Engineering Co., mentioned that in 15 years as a power plant operator he had never found a need for this material.

The discussion of balancing of rotating equipment was introduced by R. B. Williams, San Diego Gas & Electric Co. He pointed out the need for proper balancing and cited the danger that might result if this were not done. He discussed the various means of balancing and outlined in detail the quadrant balancing analysis as used at San Diego.

Degree of vibration allowed was discussed and the various practices cited. R. B. Barton, General Electric, gave a formula for the permissible amplitude with changes in frequency as follows: (Amplitude) x (Frequency) $^{1.6}$ = K.

The use of balancing equipment, the writing of specifications to require dynamic balancing and the scheduling of vibration checks were discussed by the group.

The subject of protective coatings for salt water service was opened by E. R. Prout, San Diego Gas & Electric Co. He mentioned the various types of protective coatings used by his company for salt water service.

Use of Thiokol for protecting condenser water boxes was tried with doubtful results. Chlorinated rubber was used successfully for hand rails, traveling screens and screen frames. It, however, is not resistant to abrasion.

A vinyl copolymer resin has shown excellent resistance to acid and alkali. It has a film strength that is high and has given the best results of the materials tried.

The used of baked plastic coating, which is applied in the manufacturer's shop, was tried for various services. In some instances this was very beneficial.

The use of neoprene coating is now being tried in a condenser water box and on traveling screens and frames.

A product not designed for service of this nature has been tried with

considerable success. This is automobile undercoater. This was tried out in the cast-iron water boxes of oil coolers and showed excellent results at the end of a six-months period.

Use of Thiokol on condenser tube sheets was reported by Jensen. The bond was not found satisfactory and the material peeled off in a short time. Use of 18-8 stainless steel on many replacement parts with excellent results was reported. He also stated that the use of neoprene on pump columns showed very good success. Gothberg said PG and E had approximately the same results as reported by the Edison company.

The question was raised concerning paints to be used for stacks. Prout stated that the use of silicone paints has proved the best at the Silver Gate station, although the cost is considerably higher. It was pointed out that stacks should be painted while cold for better results.

Jensen reported that neoprene coating was tried in the inlet ends of condenser tubes and that failure resulted within two months. His company has found that the tube sheet, rather than the water box, should be painted. When the water box is painted, any small failure of the coating will result in greatly increased action at the point of failure.

The question of why magnesium rod might not be used to protect condenser water boxes in the manner now used in hot water heaters was raised. The Edison company had tried this and found the consumption of magnesium was so high that the cost was prohibitive.

Central Control Rooms

Discussion on central control rooms in modern steam plants was opened by Gothberg. He covered the various factors that influenced the design of control rooms, some of which are: the number of operators required; type of men required; well-being of the men; job satisfaction; better operation. He explained advantages and disadvantages of three general types of control rooms: (1) completely isolated that can be located anywhere; (2) semi-isolated, which is located where a view can be had of the major operating equipment; and (3) centrally located.

Jensen said that the Edison company has a closed control room for two units and requires seven to eight men for operation. Gothberg added that his company uses three men in the control room and a total of seven or eight more for four or five units. His company designs the plants so that all major auxiliary equipment is on the turbine floor. The boiler water gage glasses are visible in the control room. Gothberg pointed out that a considerable study had been made of the proper arrangement of instruments on the control panels.

Austin, Southern California Edison, explained his company's ideas of the proper design of central control rooms. A. A. Lingo stated that the steam plant now being built by the California Electric Power Co. will be entirely out-of-doors except for the control room, which will be located between the two boilers.

Equipment Overhaul

Discussion of overhaul of main and auxiliary equipment was opened by E. J. Huskison, Arizona Public Service Co., who outlined the overhaul schedules of his company. The older units are overhauled after 10,000 to 12,000 hours of operation or at five-year intervals. On units installed since 1948, overhauls are performed after 25,000 to 30,000 hours of operation or at five-year intervals. All units are inspected annually as this is a requirement of the insurance underwriters.

Gothberg said PG and E overhauls main units every three years, with inspection of bearings and governors every year.

In the overhaul of boiler feed pumps, the Edison company does not maintain a periodic schedule but bases the need of overhaul on efficiency tests. The Arizona Public Service overhauls boiler feed pumps every three years.

The frequency of testing of protective devices was discussed. Practice of the different companies varies considerably. Barton stated that an overspeed test should be run at least every six months.

Circulating Water Pumps

Jess Zeigler, Hawaiian Electric Co., opened the discussion on circulating water pump types by making a comparison of the horizontal centrifugal and the vertical propeller types of pumps. He presented curves showing the operating characteristics of these two types of pumps and commented on their application in service. He also mentioned the control of shut-off head as a function of suction well dimensions. This is a new approach to this problem and apparently is a satisfactory solution. O. H. Hedrich, Fluor Corp., and Gothberg discussed the use of Chapman check valves in circulating water pump discharge lines.

Use of open and closed impellers on mixed-flow pumps was discussed. It was brought out that the use of an open impeller results in attack on the casing in the area adjacent to the impeller. Circulating water pump bearings were discussed. Rubber, leaded bronze and plastic materials are all being used satisfactorily.

Reheat

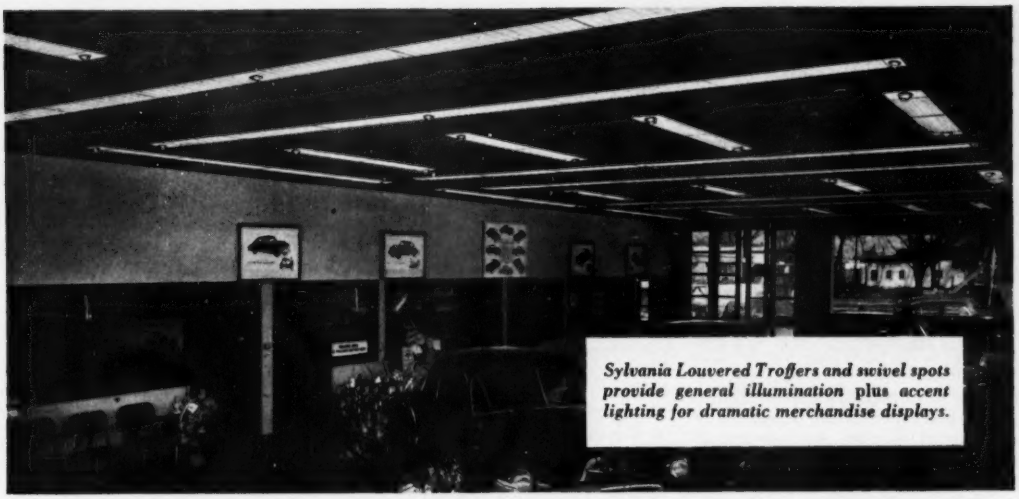
The discussion of reheat was opened by four short talks by representatives of equipment manufacturers. These were: for boilers, R. H. Tilghman, C. C. Moore & Co., and H. G. Thielscher, Combustion Engineering; for turbines, R. B. Barton, General Electric, and H. A. Langston, Westinghouse. Theory and operating problems were discussed at length and a complete picture of the use of a reheat system was described. In general, it was felt that the operation of reheat units was no more difficult than that of the conventional design.

Experiences of PG and E with a reheat plant were given by Gothberg. He pointed out that with the old 1,250-psi/750° unit with two boilers per turbine that the problems involved were considerably simpler than might be expected with the modern high-temperature single-boiler installation. He expressed a doubt that a reheat unit could pick up load at as fast a rate as required of machines on his system. Barton and Thielscher mentioned the times involved in load pick-up at the Dunkirk station. Gothberg felt that although these tests were satisfactory, this rate of pick-up might not be practical in continuous operation.

Maintenance Personnel

The discussion on training of maintenance personnel was opened by Jensen. He outlined the method whereby members of the maintenance organization of his company advanced through various positions to the top position. A progress chart demonstrating the various relationships of different positions was shown. Huskison then outlined the practice of the Arizona Public Service. This company has a formal classroom training program whose work is done in cooperation with the state.

Negley, Southern California Edison, explained his company's use of tests for job applicants. They have found that an I.Q. test and a short simple



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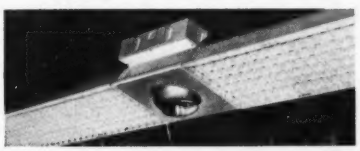

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test in physics have been a very satisfactory means of determining the applicant's power plant potential. Other training programs were discussed, and Williams (San Diego) outlined in detail his company's proposed training program.

Substation Group
P. L. Savage, Sponsor

The substation group meeting was presented in the form of panel discussions that proved most interesting. It was particularly gratifying in that it encouraged discussion from those attending who ordinarily had not participated in the meeting. In some cases discussions from the floor exceeded the time of formal presentations, which was an indication of the popularity of this type of meeting. Average attendance was 37 and in some cases it was necessary to hang out the "SRO" sign.

In the first conference on the subject of maintenance and modernization of circuit breakers, Earl Meldrim, PG and E, covered two subjects of considerable interest to the group. Under the heading of maintenance of compressed air circuit breakers he discussed, in particular, experience with their large installation at Mission sub. It was pointed out that maintenance was nominal, consisting of regular inspections and blowdown of the pressure system and that, after 10 or 12 years of operation, the manufacturer had informed him that they had yet to receive an order for repair parts.

In speaking of the maintenance of high-voltage-type compressed air breakers, he stated that his experience, as well as the experience of other companies of which he had knowledge, indicated that maintenance was practically nonexistent. Meldrim felt that a five-year period for routine overhaul was reasonable and concluded from PG and E experience that the compressed air breaker is a very satisfactory type.

H. F. Saliger, Southern California Edison, outlined his company's program in the modernization of a large group of high-voltage oil circuit breakers to increase interrupting speed and bring up the interrupting capacity to modern standards. This program involved new interrupters and mechanisms and included overhaul of all circuit breaker bushings. Results of this program were most gratifying and had brought about higher operating performance and reduced maintenance.

In covering his subject, 4-kv and 15-kv magnetic blow-out-type breakers, C. D. Mack, distribution engineer for San Diego Gas & Electric Co., emphasized the importance of working closely with the manufacturer on mutual problems toward improvement of the product. Because of the greatly reduced fire hazard of air circuit breakers, he made a plea for further improvement in reducing or eliminating the material in the circuit breaker that would support combustion. Discusssion on this subject indicated that some of the manufacturers were working toward this end and actually had breakers to offer using the improved materials.

The subject of factory-assembled and conventional substations was discussed by H. N. Skow, Westinghouse, San Francisco; G. L. Barcus, General Electric, Los Angeles; and H. H. Mitchell, Kelman Electric Mfg. Co. Much spirited discussion was invoked on this subject. The end result seemed to be that, while there appears to be a definite place for both types of substations, there are a number of cases where, either because of cost saving or space limitations, the factory-assembled substations fit very well into the utilities' program. On the other hand, there are enough special problems to justify use of the conventional substation for the immediate future. It was pointed out that the application of factory-assembled equipment requires close cooperation between the manufacturer and the user in choosing the type of equipment best suited to the application involved, but that standard designs must be adhered to if the greatest economy is to be realized.

I. W. Best, Allis-Chalmers, represented the manufacturers in the age-old problem of noise in substations. He pointed out that manufacturers were making every effort to improve their equipment to eliminate noise. In addition, steel manufacturers are carrying on extensive research to develop better steel from the standpoint of noise because of magneto striction. The utility viewpoint was presented by Arnold Coambs, PG and E. He said that his company had made great progress in keeping noise complaints to a minimum by first convincing nearby residents that PG and E was doing everything in its power to minimize noise and secondly by making substations attractive from an architectural standpoint.

A panel discussion on rotating amplifier-type voltage regulators for synchronous condensers was led by Ray R. Klumb, Southern California Edison. Both Klumb and Owen Craighead, PG and E, presented the users' viewpoint. They indicated a very definite preference on the part of the utility industry for this newer type of regulating equipment for the larger machines, both from the standpoint of lowered maintenance and improved performance.

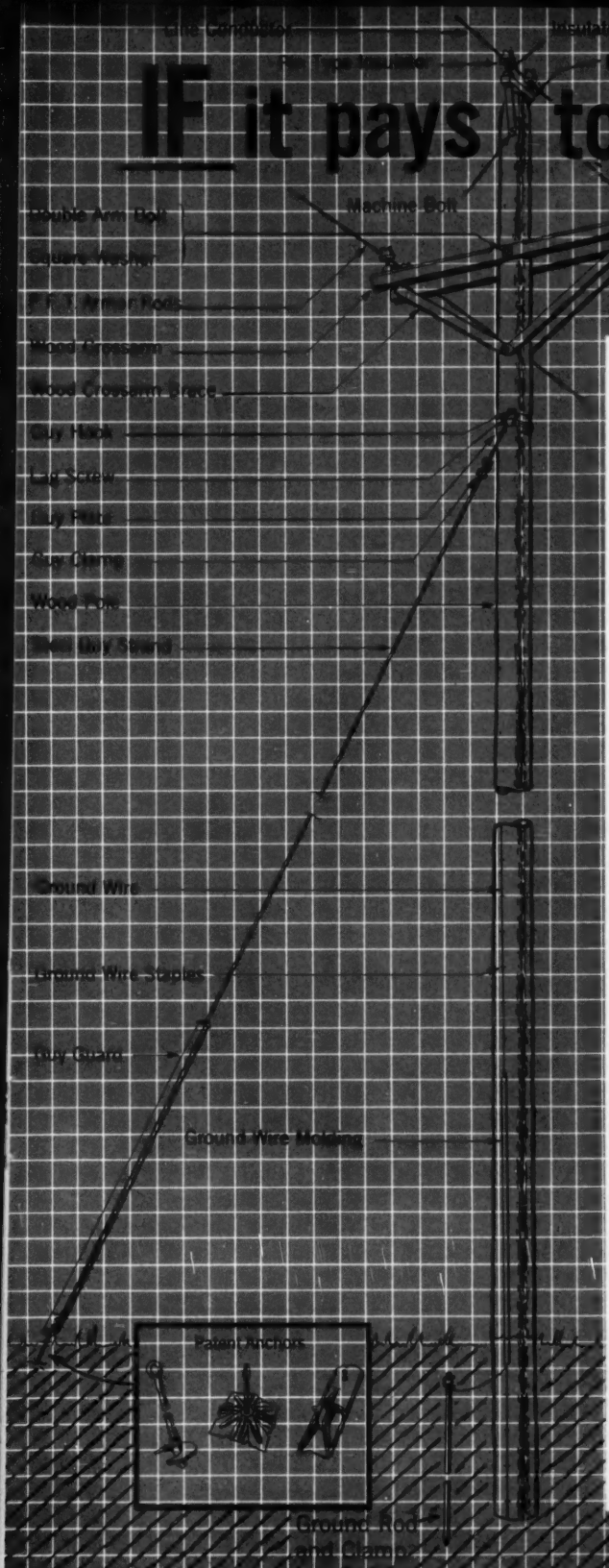
S. R. Durand, Allis-Chalmers, described the Regulex type of regulator; Whit Rigdway, General Electric, described his company's Amplidyne regulator; Charles Manners, Westinghouse, covered the Rotatrol type of voltage regulator. These three speakers covered the basic principles of operation of the equipment, giving special attention to more recent improvements and additions to their equipment in the form of such items as variable lower limit and high load limit for the equipment.

Transformer loading and overloading practice, including effects of high ambient temperatures, was discussed by T. A. Phillips, Arizona Public Service Co. He pointed out the difficulty of accurately analyzing the problem because of the widely varying conditions, even on its one system, as regards maximum ambient temperature, duration of the high ambient and the coexistence of peak load conditions with the high ambient temperatures. He outlined Seeley's method of determining equivalent ambient temperatures and concluded that, for the conditions on his system, in general, it should be possible to load the transformers approximately according to the name-plate rating. He discussed briefly the philosophy of loading transformers to obtain maximum economic advantage as contrasted to merely obtaining maximum life. There was a great deal of discussion on this subject from the audience, including such points as low sludging and double- and triple-rated transformers.

Underground T & D Group
C. N. Parker, Sponsor

Under the leadership of J. B. Bowen, San Diego Gas & Electric Co., a discussion of increasing cable life through improved design and maintenance was held. B. L. Peter, PG and E, told of a study made of 385 failures in paper-insulated, lead-covered cables during the past three years. The greatest single cause of failure among these cables was attributed to insulation failure. However, with the more important 12-kv tie cables, cable movement was held responsible for about one-half of the failures. Cable-bending tests showed that, by increasing the dimensions of the manholes used from 5x7 ft to 7x12 ft, so that a minimum bending radius of 32 in. or about 12 times the outside diameter of the cable could be obtained, the life of the cable was increased 45 times.

IF it pays to standardize construction



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E. E. Neher, P G and E, said that preventive maintenance of installed cables operating under present-day load demands requires a program of routine inspection where the position and condition of these cables are noted. Any unusual cable movement observed may require some special repair or support to prevent the cable sheath from certain damage, if such conditions are allowed to continue. Peter described a simple method for continuous measurement of pulling tensions in cables and stated that the results of these tests are quite erratic and show variable coefficients of friction. He emphasized the importance of using extreme care in laying duct, particularly in runs of 700 ft or greater, in order to stay within maximum pulling tensions recommended by the manufacturer.

In a round-table discussion led by B. L. Peter, the properties of synthetic rubber compounds and thermoplastics as insulation and sheaths were described by Ernest W. Davis, director of engineering of the Simplex Wire & Cable Co. As a result of chemical research and technological developments during and subsequent to World War II, there has become available a new field of electrical insulating materials and protective sheath coverings. These offer a wide range of electrical, chemical and physical properties with longer life expectancy than thought possible a decade ago. Davis compared the properties of the synthetic rubber compounds with those employing natural rubbers and pointed out how, by employing some of the synthetic rubbers and thermoplastic compounds available today, wire and cable failures can be considerably reduced. R. A. Schatzel, director of engineering for Rome Cable Corp., emphasized the tremendous progress made during the last 20 years in the synthetic rubber industry. The new products of this industry have required new methods of evaluation and testing. S. J. Rosch, consulting cable engineer, Anaconda Wire & Cable Co., discussed overload capacities in various types of insulating material. The use of cold rubber insulating materials and other new developments offer many possibilities, he said. I. W. Borda, Okonite Co., cautioned against indiscriminate use in important circuits of compounds not proved by actual life tests.

Under the subject of low-cost residential underground, Carl Williams of the Hawaiian Electric Co. Ltd. described the installation of approximately eight miles of underground system in the Aina Haina Valley. Directly buried, synthetic rubber, shielded, and neoprene-jacketed cables along with prefabricated transformer enclosures and secondary service boxes are used.

Under the leadership of R. C. Blankenburg, Southern California Edison, new developments in underground practice were discussed.

In the recently completed installation of 110-kv underground transmission cable, the Pacific Gas and Electric Co. spaced the precast manholes up to a maximum of 2,560 ft. F. B. Schullerts of that company compared the 26 miles of pipe-type, nitrogen-filled cable installation with an earlier oil-filled 110-kv cable.

An illustrated talk describing the unusual features of the 25-kv Puget Sound submarine cable installation was given by Borda. Following a description of a new 200-amp 15-kv boric acid fuse in a subway enclosure, it was generally agreed that the minimum interrupting capacity needed was 250,000 kva.

A lively discussion followed the paper, "Insulated Aluminum Wire and Cable," presented by Borda. A number of cable installations were described and the problems of carrying capacity, splicing and terminating were discussed. Savings up to 20% may be made on the purchase of larger sizes of cable. Davis spoke of the apparent lack of unanimity of opinion on splicing methods and termination. It was Rosch's opinion that the installed cost of aluminum would not be less than that of equivalent copper for the next five years at least.

In the last paper of the meeting S. J. Rosch, Anaconda Wire & Cable Co., discussed the use of load vs neoprene covers for underground cables. After comparing the advantages and disadvantages of the two materials and the causes of failure on each, he concluded that lead is the safest jacket but that neoprene gives good service. He stated that shielding is imperative above 5 kv but that, in his opinion, it should be used down to 3 kv.

● Certificates were given 18 Salt Lake City electrical executives recently for completion of a course "Supervisory Problems in Human Relations," sponsored by the **Intermountain Electrical Assn.** and the adult education department of Salt Lake City Board of Education, the State Department of Public Instruction and the Salt Lake City Chamber of Commerce. Walter B. Schulze of the City Board of Education was instructor and Ken Brady, chairman of the education committee of IEA, headed the latter's arrangements.

CMUA Meets Regionally

Northern California members of the California Municipal Utility Assn. interested in operating problems gathered for an afternoon and evening meeting in Sacramento on Feb. 29, under the chairmanship of Carl Richey, Sacramento Municipal District. Discussion of material supply problems brought out the point that material restrictions have forced longer range planning, and that nation-wide cooperation in reducing inventories has relieved the situation.

Questioning of members on load growth experienced indicated increases ranging from 100 to 300% in demand in the past 10 years with even a greater increase in energy consumption. This clearly showed the need for greater emphasis on long-range planning. Load building promotion was discussed by R. L. Dunshee, Sacramento MUD. He outlined the very comprehensive program of his utility and displayed samples of the large number of promotional pieces used.

Storm damage lessons, led by C. E. Edmunds, Truckee, revealed the severity of the past winter storms in the high Sierra. He said the snow was so deep in Truckee that children were skiing right over his secondary wires. Despite unprecedented conditions, his company had comparatively little trouble. Edmunds made the rather amazing statement that the 69- and 110-kv lines of another utility were operating completely buried in snow. Signs were put up to warn skiers. SMUD said the moral to wind damage they suffered was to exercise greater care in sagging ACSR conductors to equal tensions and in balancing stresses on poles and crossarms. Discussion of problems in the use of aluminum in place of copper for urban distribution pointed up the lack of suitable accessories for aluminum and the fact that constant vigil must be exercised by foremen and supervisory personnel to see that established techniques in the use of aluminum were rigidly adhered to.

The free access material plan is effecting large savings in stores expense and accounting, W. J. Nolan, SMUD, told the group. No requisition is required for line gangs to obtain items of relatively low cost moving with high frequency, such as bolts, washers, screws, braces, etc. The plan has saved the writing and the large accounting cost of handling 6,000 requisitions per month.

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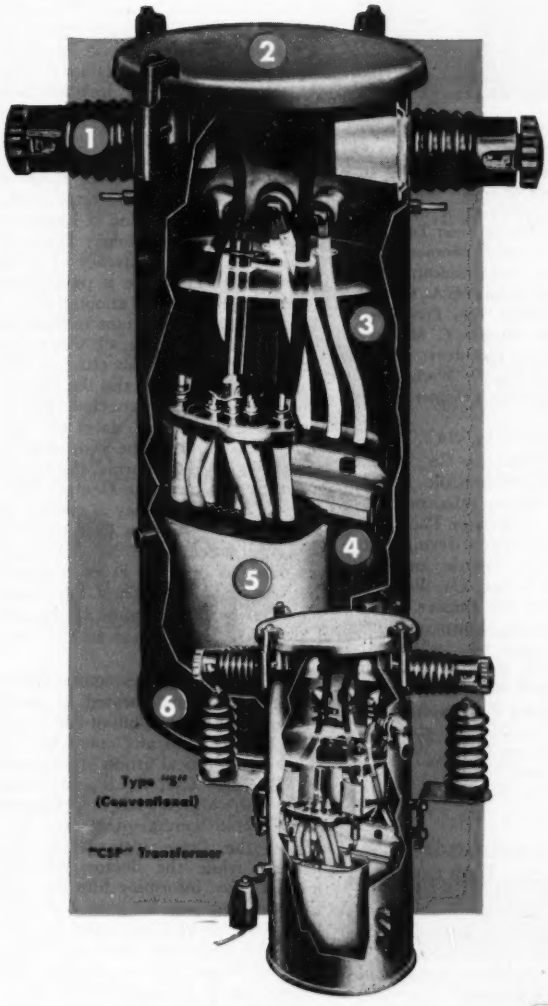

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Washington State Law

The proposed meeting of "all segments of the Electrical Industry" of Washington State, originally scheduled to be held in Yakima on March 28-30 to discuss legislation, has been postponed until May 3 and 4. This announcement was made by John B. Majerus, executive secretary-manager of the Puget Sound Chapter, National Electrical Contractors Assn., named temporary chairman, who stated that different groups and individuals representing larger interests had requested the postponement, giving them more time to consider the legislation required and the legislation they would back. Pending meetings of electrical groups in the Puget Sound area, including the National Association of Electrical Distributors in Victoria, May 13, 14 and 15, and the Joint Meeting of the Puget Sound Chapter IAEI and the Oregon Chapter of the IAEI in Longview, Wash., on April 26, were also considered in making the change, Majerus said. The proposed Yakima meeting is being "sparked" by the Puget Sound Chapter, IAEI.

Fred Goss, Electric Supplies Distributing Co. and member of NPA wholesalers advisory committee, speaker when Earl Pridemore, right, owner of Pacific Electric Co., was installed as president of San Diego Chapter, NECA. Others were: Tom Ford, Bay-Boulevard Electric, governor; E. V. Hughes, Oceanside, vice-president; Joe Bollinger, Oceanside, treasurer; A. C. Eddy, Ets-Hokin & Galvan; Tom Ford; Oscar Lundberg, Capitol Electric; C. M. Sieger, Owl Electric, past president; Richard Becker, California Electric Works—directors. Peter Montgomery is chapter manager

Distributors to Victoria

Victoria is readying for the spring convention of the National Association of Electrical Distributors, May 13-15. Already reservations at the Empress Hotel are taxing the facilities, according to R. A. Balzari, secretary of the Pacific Zone.

The program in general will give one day's session to apparatus and supply problems, the second day to appliances. Of the former selling and the economic forecast are the two main topics, each to be handled by a well-qualified speaker. A Canadian utility man will present views of the electrical supply industry. For the appliance program, Les Hoffman will bring members up to the minute on the radio-TV situation. A nationally known authority on major appliances is being invited to present his views and the housewares situation will be treated by another authority.

Arthur Hooper, editor of *Electrical Wholesaling* magazine, is scheduled to speak on the Thursday morning program.

Convention committees named for the meeting are: Convention arrangements: W. M. Jewell, Westinghouse Electric Supply, Seattle, chairman, assisted by Jim Hartwig of North Coast Electric Co. and O. B. Hubenthal of the G-E Supply Co., Seattle. Program: M. E. Robertson, Peerless Electric Co., Seattle, chairman, assisted by Bruce Wilson of Thompson-Diggs of San Francisco; Irving Bean, Bean Electric Co., Seattle, and S. S. Brundage, G-E Supply Co., Portland. Entertainment: Leslie Stusser, Stusser Electric Co., Seattle, chairman. Entertainment chairman for ladies, Mrs. Charlotte Widrig, wife of T. S. Widrig, the Trumbull Electric Mfg. Co., Seattle. Golf: John P. Lawton, Graybar Electric Co., Seattle, chairman, assisted by George Gray, Wiremold Co., San Francisco.

IEA

Among recent chapter elections were those in Ogden and Utah County. In Ogden Norwood F. Crawford, Mountain States Telephone & Telegraph Co., was elected president; Alfred Cook, Kiesel Sales & Service Co., vice-president; Boyd A. Read, Read Brothers Co., immediate past president; Delbert F. Foulger, Utah Power & Light Co., secretary-treasurer; and for directors Russell Waldron, George Coray, Clyde Hill, Orville Sackett and William Palmer.

In the Utah County Chapter Leland B. Wakefield, Wakefield's Inc., was named president; LeLand Priday, Chipman Merc. Co., vice-president; and directors Rollo J. Anderson, Arnold Angel, L. H. Curtis, George E. Larsen, Earnest Salerno. H. Gilbert Barton is the secretary-treasurer.

● Final plans were being completed for the **Rocky Mountain Electrical League** annual spring conference, April 20-22, at the Shirley-Savoy Hotel, Denver. The accounting, adequate wiring, engineering, information, sales and promotion committees of the league each would have parallel sessions to discuss pertinent and timely problems. A full story on the meeting will appear in a later issue. The RMEL electric meter institute was held at Denver University campus March 24-28.

● **Latest information** as to dates of the series of chapter meetings of the International Association of Electrical Inspectors at which Robert Peterson, technical assistant secretary of IAEI from Chicago, will be a participant changes some of those announced last issue. The Idaho Chapter meeting at Pocatello's Hotel Bannock will be on April 22. The joint meeting of the Puget Sound Chapter and the Oregon Chapter will be at Longview, Wash., April 26. Conflict of dates for two others may result in the joint meeting of the Northern California, the Sacramento Valley and the Central California Chapters on May 3, possibly in Oakland. The Arizona Chapter date is May 10 at Scottsdale. Nevada Chapter meets at the Last Frontier Hotel, Las Vegas, May 16. The Utah Chapter meets at the Newhouse Hotel, Salt Lake City, May 19.

● **Willard M. Nott,** Sangamo representative, was inaugurated as president of the Electric Club of San Francisco by means of an "operation" to check his "physical fitness" performed by "Doctors" Cyr, Ryals and Black, at the club's March 3 meeting. Charles Huyck, club secretary-treasurer, furnished the "case history" on the patient, while the doctors brought forth a baby, informing him that the Electric Club was his baby for 1952. Directors elected included Robert Neal, Westinghouse Electric Corp., William Hines, PG and E Co., and Robert Keene, General Electric Co.

● **First of a series** of meetings in different districts of the state was being prepared by the Idaho State Electrical Contractors Assn., according to J. Carl Baldridge, secretary. It will be held at Caldwell and others arranged for in succession during the early spring.

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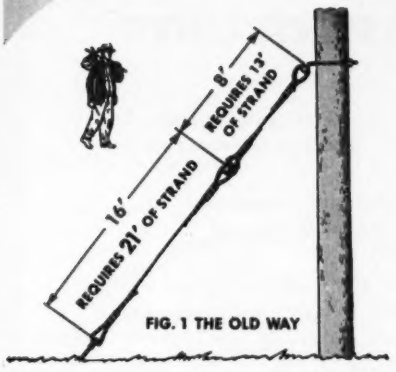

FIG. 1 THE OLD WAY

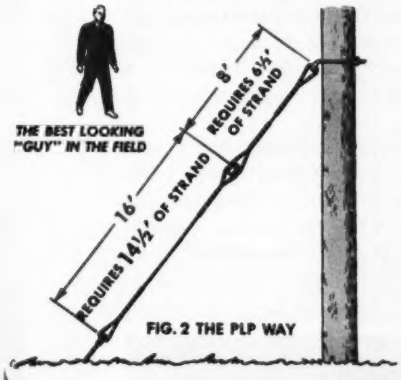

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FIG. 2 THE PLP WAY

● With PLP GUY-GRIPS, you save critical guy strand and get stronger, safer guys. *For example,* let's consider the 24-foot, 6000# guy (Fig. 1). Doing the job in this conventional way, using Siemens-Martin Strand, requires:

13' of ⅜" strand (TS 6950#)
weighing 273#/1000' = 3.549 lbs.

21' of ⅜" strand (TS 6950#)
weighing 273#/1000' = 5.733 lbs.

9.282 lbs.

But the equivalent PLP Guy-Grip installation (Fig. 2) using 3-wire Extra-High Strength strand, requires only:

6½' of ¼" EHS strand (TS 6600#)
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2.451 lbs.

SAVING --- 6.831 lbs.

Making this Guy the PLP way results in a saving of 73% of critical guy strand . . . and you eliminate the need of any clamps.

With PLP Guy-Grips, even wrenches are not needed. Simply install by hand! (Fig. 4). Any lineman . . . regardless of his skill . . . can do a perfect job every time. *Installation time is cut in half.*

Substantial dollar savings are the result even with "B" and "C" coated strand.

PLP Guy-Grips are available for strand sizes from 1/4" through 1/2".

FIG. 3—PLP Guy-Grips consist of Preformed Armor Rods preassembled in Guy-Grip sets.

FIG. 4—To install, simply pass through guy-strain insulator or "through-bolt" and rotate ends around guy strand . . . by hand.

FIG. 5—PLP Guy-Grips assure the same tight gripping action as in the case of splices.

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The improved CSH single-phase meter and the new CSH-8 polyphase unit (illustrated here) are typical examples of the way Westinghouse pioneers to produce savings for you. Into the CSH meter have gone many new improvements to make it easier, and more practical for you to measure demand on single-phase loads. And the new CSH-8 is the first thermal demand unit available in a socket base for polyphase circuits. Both units combine standard watthour meters with practical thermal demand meters—in a single case—to answer your need for low first cost . . . lower installation and maintenance costs.

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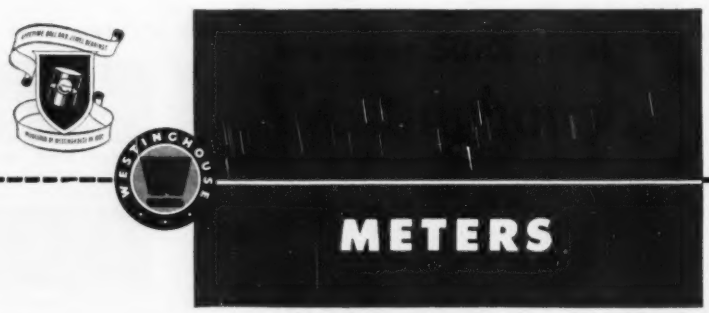
For complete information on CSH Meters write for Catalog Sections 42-337 and 42-338. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40394



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Type CSH-8 socket-type, combination watthour and thermal watt demand meter for polyphase circuits.

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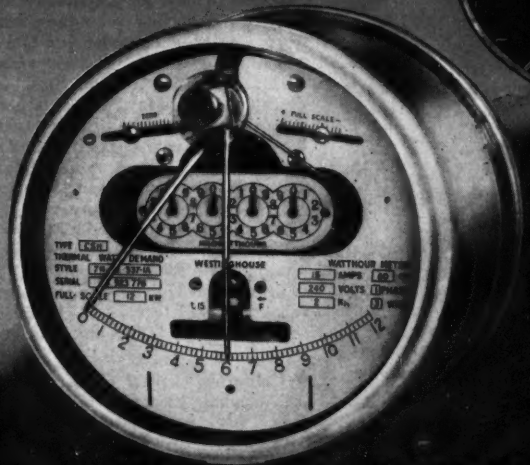

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Heavy Duty Waterproof Receptacles and Plugs

15 to 200 amperes, 250 volts, D.C., 440 and 600 volts, A.C. 2, 3 and 4 poles — polarized.

Polarized plugs cannot be inserted incorrectly. Sealed cable grip excludes all dirt and moisture. Ample wiring space facilitates servicing and inspection.

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● **Excellent response** to the evening course in practical illumination organized by the Northern California Section, Illuminating Engineering Society, and the Mother Lode Chapter in Sacramento is reported by John Walsh, PG and E, chairman of the educational committee. The first series of meetings was attended by 70 in San Jose, 90 in San Francisco and 40 in Sacramento. Meetings started March 17, 18 and 19 and will run 12 weeks to June 2, 3 and 4, respectively. William Addison is the San Jose chairman, John Keyes, San Francisco chairman, and Clark Baker, Sacramento chairman. Instructors include H. H. Robison, C. T. Bakeman, S. H. Hazleton Jr., Robert Dummel, Walsh, R. E. Lagerstrom, Robert Thallon, C. W. Macy, Scott Beamer, Carl Martin and Matt Cabott. A charge of $12 is made for the course.

● **Appliance Merchandisers Assn.** of Phoenix had on its schedule for the next few months an evaporative and refrigerated cooling promotion from April 1 to May 15 under Jim Donohue, Climate Control Co., chairman; Paul C. Johnson, Johnson Bros., co-chairman. From May 15-31 automatic laundries were to be featured with Bill Somers, Electric Equipment Co. of Arizona, chairman, and Millard Smith, Westinghouse Electric Supply Co., co-chairman. A two-week campaign in June on electric ranges is also contemplated with Bill Constance, Westinghouse Electric Supply Co., as chairman and Hubert Davis, Arizona Wholesale Supply Co., co-chairman, according to Jack Canady, manager.

● **California Central Coast Chapter** of National Electrical Contractors Assn., with headquarters at Santa Barbara, elected John Heritage of Santa Maria as both its president and governor. Vice-president is Clinton W. Smith of Santa Barbara, second vice-president, John Gordon, Ventura, and Perry J. Martinsen, California Electric, Santa Barbara, is treasurer. Will Pregill is manager. This chapter will act as host for the annual District 6 NECA conference in Santa Barbara, May 9-10.

● **Recently elected** officers of the Sacramento Valley Chapter of NECA were Lewis Stein, president, W. E. Cotter, vice-president, Paul Benge, secretary, John Decker, treasurer, and Bert Naylor, Frank R. Merwin and J. E. Newmarch, past president, as directors. Merwin is also chapter member of the NECA Board of Governors. W. H. Welsh is manager.

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THE MONTH IN BRIEF

American Will Distribute WWP Stock

Directors of American Power & Light Co. last month decided to order distribution of Washington Water Power common stock rather than to sell to Washington PUDs as urged by AP&L President Howard Aller. Ebasco, which reportedly owns 183,050 shares of the stock to American's 2,541,000, had pushed the distribution plan, as had others opposed to the PUD plan. (The three PUDs planned to issue some $102 million in revenue bonds to buy the company. Of that total, base price for Water Power would have been $65,115,000, with the balance going to retire obligations. Guy C. Myers, New York promoter, would have received two-tenths of one per cent on net proceeds of the bonds sold and eight-tenths of one per cent out of profits over a 10-year period.) American's decision clears the way for compliance with the SEC dissolution order under the holding company act. Next step will be for American to file its distribution plan with SEC. Before the decision, the injunction of the Ninth Circuit Court of Appeals at San Francisco against SEC hearing on the PUD purchase plan was dissolved.

FPC Denies Request for Rehearing on Pelton

Request for rehearing of its Dec. 21 opinion granting a 50-year license to Portland General Electric Co. for Pelton project has been denied by FPC. The rehearing was requested by the State of Oregon, Oregon Fish Commission and Oregon State Game Commission.

PUC Will Rule in Wind Machine Case

California's PUC has entered the discussion between Southern California Edison Co. and citrus growers over equipping electrically driven wind machines with time-delay relays or manual switches. With increase in the number of the machines, Edison said that provision must be made against overload when all the machines come on at once. (Starting current is several times greater on the powerful motors than running current.) Edison first set Feb. 1 as the deadline for installing protective equipment, postponed it until May 1 after protests from growers that equipment was not available. At a PUC hearing, grower spokesmen contended that expense of installing new switches should not be borne by the growers. The company pointed out that, under previously approved regulations, a customer having an installation detrimental to the electric service of others may be required to provide, at his own expense, suitable protective equipment.

Whatcom Opposed to Expansion Plan

Whatcom County PUD of Bellingham, Wash., has rejected a plan from a joint board representing six other PUDs in the state to expand generating facilities of Puget Sound Power & Light Co., if their proposed purchase of the system goes through. Whatcom expressed doubt that the joint board is legally constituted. The expansion program would increase generating capacity from a present 325,000 kw to 500,000 kw.

Tacoma Court Action Transferred

City of Tacoma's court action to eliminate legal barriers to construction of its Cowlitz River development has been transferred to the Superior Court in Thurston County. The move was made to prevent question of legality as to jurisdiction, according to Dean Barline, assistant corporation counsel.

Income Taxes Chargeable to Operating Expense

Income taxes are a proper charge to operating expenses of a public utility, the California Public Utilities Commission declared in a decision authorizing an interim rate increase by the Southern California Gas Co. The PUC opinion was based on U. S. Supreme Court rulings. During hearings, OPS urged exclusion of the portion of the increased income taxes attributable to higher tax rates since the start of the Korean conflict. The commission pointed out, "this method may be appropriate for an unregulated industry, but regulated utilities render service at cost, plus a reasonable return on the property devoted to public service. Every increase in income tax rates lowers the return."

San Diego Starts Encina Plant

San Diego Gas & Electric Co. has started construction of its Encina plant, which will have an eventual capacity of 400,000 kw and cost an estimated $60 million. Immediate schedule calls for building construction this year and installation of a 100,000-kw generator by October 1954. Cost of the first unit is estimated at $16 million.

Ceremonies Mark Start of The Dalles Dam

Ceremonies at Celilo Falls locks in Oregon last month marked the official beginning of the $350 million The Dalles Dam, fifth government power project on the Columbia River. The dam will begin producing power in November 1957. Initial capacity is 1,092,000 kw, but provision has been made for an additional 624,000 kw. Construction is under direction of the Corps of Engineers, with Hubert Elder in charge.

Will Improve Television

Bell Lab has developed a cam-operated mirror device that will convert 24-frame motion pictures to 30 frames per second to match the 30 frames used in television. If commercially adopted this will improve TV pictures from standard motion picture film. New films being produced especially for TV are made at 30 frames per second to obviate the trouble.

Ignitrons Furnish D-C for Locomotives

Westinghouse is meeting with encouraging results in the use of Ignitron rectifiers for a-c to d-c conversion on electric locomotives. Rectifiers in place of rotating machinery may give an impetus to railway electrification.

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Type 1—for aluminum-to-aluminum— and **Type 2**—for aluminum-to-copper —are used for smaller wire sizes, up to and including 4 ACSR.

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All 4 types have the advantage of like-metal contacts, with desirable *wide jaw* design for aluminum connections. Also, they are of one-piece construction for ease of handling and installation—and are *built like a vise . . . grip like a vise.*

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New "325" Attachment
. . . Derrick and Digger Unit

For 3/4 and 1-TON TRUCKS

Why send a five man truck and crew on pole replacement or service jobs that can now be handled by two men and a highly portable ¾ or one ton service truck? The "325" attachment makes it possible for two men to set up the derrick, attach the digger, dig the hole and set the pole ready for tamping *in less than ten minutes*! This set-up, with or without radio communication, speeds up line work and cuts costs way down.

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★ Sets poles up to 35'; take augers 8" to 20" diameter

★ Packaged unit for installation by your local mechanic

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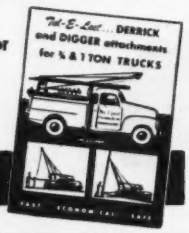

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Keep Harmony between Trees and Wires

DAVEY LINE CLEARING BUILDS GOODWILL THRU QUALITY WORK

WESTERN HOME OWNERS prize their trees . . . select their tree service with care. That's why they always appreciate the quality and safety of line clearing by Davey. For Davey line clearing insures safety of life and property as well as the trees' welfare and is the best as well as the best known.

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ORIGINATORS OF TREE SURGERY

THIS MONTH'S NEWS

Decisions for Government In Court Actions

U. S. District Judge Sam Driver has ruled that the government's taking of land for McNary Dam is neither "arbitrary" nor "capricious," in a case brought by a property owner who challenged acquisition of 8,000 acres for the dam and 38,000 acres for the reservoir.

In another recent case, Judge Driver signed an order halting construction of a $2 million bridge over the river near The Dalles Dam site. The Department of Justice had brought a condemnation action against sponsoring counties, City of The Dalles, the States of Washington and Oregon and the contractor, Guy F. Atkinson Co., on grounds that the bridge would interfere with access to the dam. Judge Driver's order gives title to bridge approach land on the Washington side of the river to the federal government. Army engineers had said earlier the two sponsoring counties would be repaid for the money they had spent on the bridge.

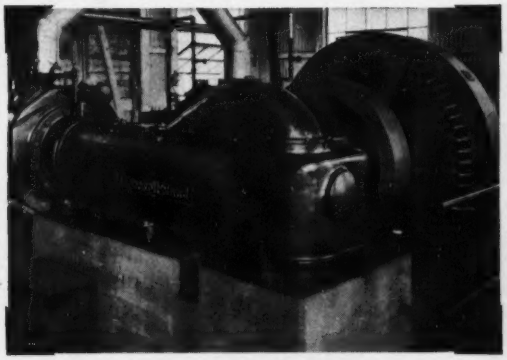
A House appropriations subcommittee has been asked to study compensation Indian tribes should receive when the reservoir created by The Dalles Dam floods Celilo Falls, their fishing ground. With Celilo Falls gone, McNary Dam reservoir will be the only remaining Columbia River fishing ground for the Indians, according to Attorney Charles Luce of Walla Walla, and Umatilla tribes have asked for camp sites and fishing grounds along the lake behind the dam, in accordance with an 1855 treaty.

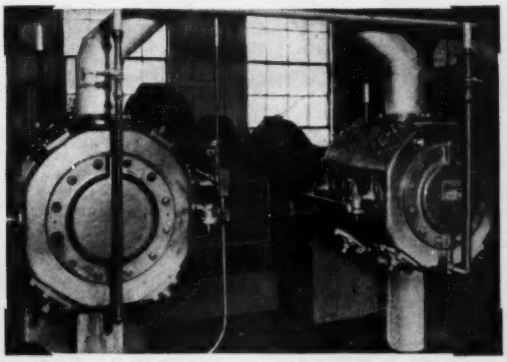
● **Opposition** to the proposed Ice Harbor Dam on the lower Snake River has been voiced in an appeal from the Washington State Game and Fisheries Department to Congress. At least 50% of the Columbia River salmon resources would be jeopardized by the dam, according to the department. Addressed to the House of Representatives' committee on ward department civil functions, the protest urged a moratorium on new hydro projects, other than those already under way, until culmination of current research to develop adequate up-and-down-stream fish passage facilities.

STANDARD ENGINEER'S REPORT

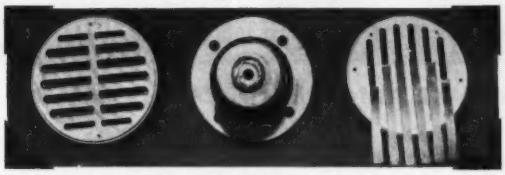
DATA	
LUBRICANT	Calol Multi-Service Oils
UNIT	Compressor cylinders - 18½" x 14"
LUBRICATOR	Force-feed
CONDITIONS	Continuous operation 24 hours per day
PERIOD	6½ years
FIRM	Glass Containers, Inc., Los Angeles, Calif.

No parts replaced in 6½ years continuous service!





AFTER 6½ YEARS OF 24-HOUR-PER-DAY OPERATION, this compressor, lubricated with Calol Multi-Service Oil 55X, still has its original rings and other parts. The wear rate on cylinders and rings is so low that inspection indicates all parts can continue in service for a much longer time. The compressor is electrically driven. Its twin cylinders, each with a capacity of 1000 cubic feet per minute, furnish compressed air for the manufacture of glass bottles in the big Los Angeles plant of Glass Containers, Inc. First put in this compressor on a trial, Calol Multi-Service Oils now lubricate all units in the plant.



MINIMUM CARBON DEPOSITS AND LOW WEAR RATE have made it unnecessary to use these spare channel valves and unloader kept on hand for the compressor.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

Now CALOL Multi-Service Oil cuts costs in all types of compressors

In crankcase and on cylinders, CALOL Multi-Service Oil reduces wear and oil consumption —has cut consumption 20% in air compressors.

A. Oxidation-resistant compounds prevent formation of varnish. Detergent keeps contaminants suspended in oil, prevents foam.

B. Special compound assures "hot-spot" lubrication...covers surfaces rapidly.

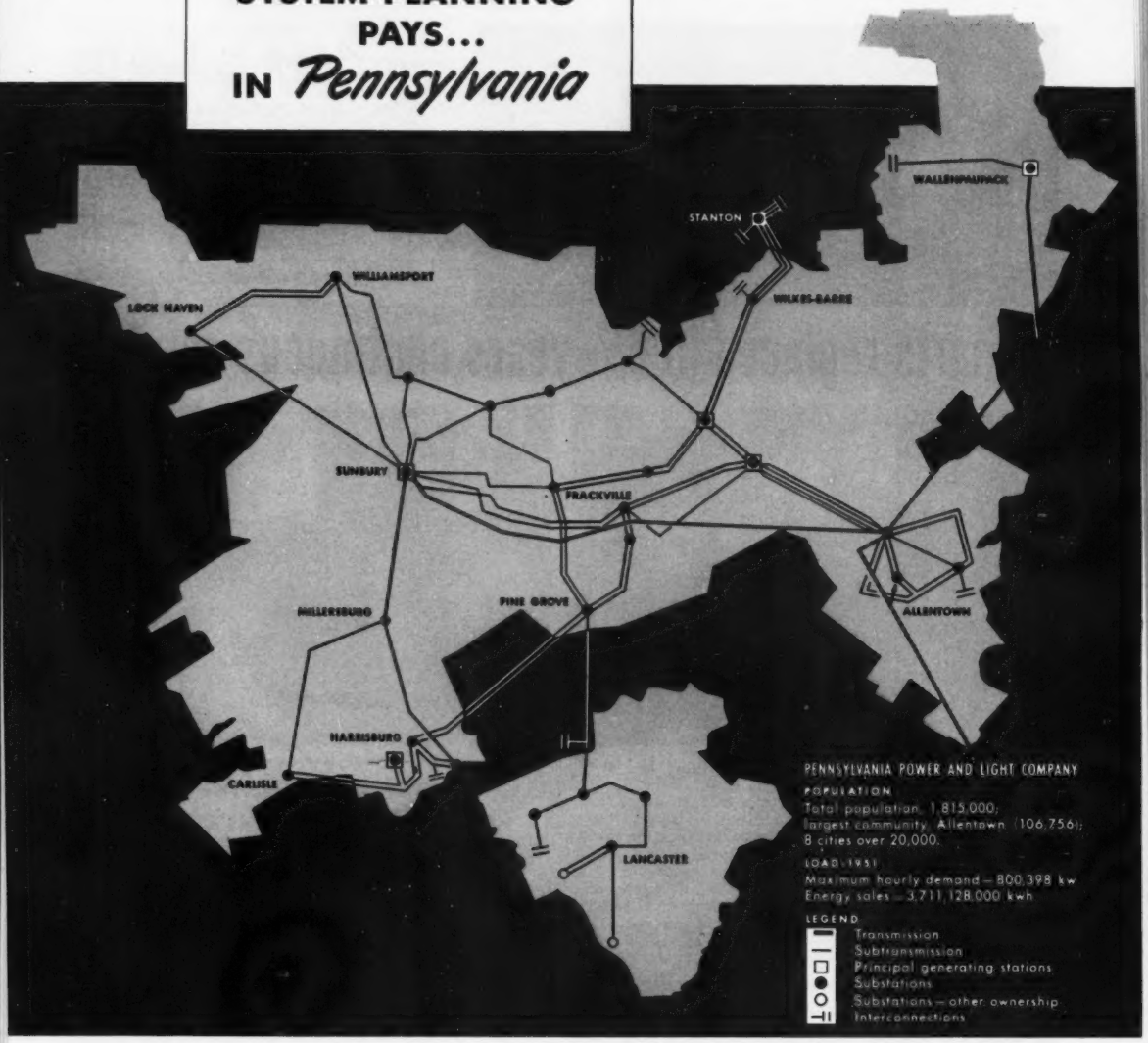
CALOL Multi-Service Oils also recommended for pumps, diesel engines, enclosed gears.

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA

SYSTEM PLANNING PAYS... IN *Pennsylvania*

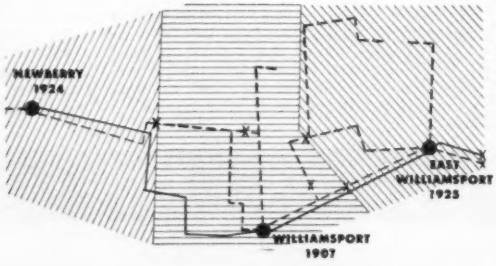


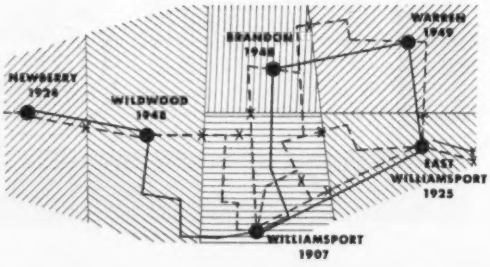
HOW THEY MET LOAD GROWTH AT WILLIAMSPORT...

In 1907, Williamsport had a load of 400 kw, with only one substation required. By 1925, the load had increased to 5000 kw, resulting in additions of substations in both the eastern and western parts of the area.

LEGEND
- ——— 12-kv lines
- — — — 4-kv lines
- //////. Area of load responsibility
- ● Substation and year established
- × Normal sectionalizing

Since 1925, the load has increased to 14,000 kw in 1951, and three more substations added. The lines feeding into Williamsport provide the reliability and capacity to expand the distribution system as the load grows.





Small power blocks ...long-range solution

Pennsylvania Power and Light Company can judge accurately the results of their system planning. Today this careful, long-range planning is reflected in their ability to supply more load . . . to grow easily and economically . . . to provide new high levels of service continuity. Small units of "load responsibility" are the cornerstone of this system, permitting them to take full advantage of modern *unitized* substations. The success of their long-range simplified system planning is measured by the practical yardstick of "economic workability".

How they built their system . . . Definite "load responsibility" such as 1500-2000 kva for 4 kv, and 3000-10,000 kva for 12 kv, is assigned to each block. As the load grows, additional blocks of load responsibility are supplied from a carefully planned 66-kv subtransmission system, covering their 9500 square miles of area served. This simplified network, in conjunction with an overlying high-voltage transmission system, permits picking up blocks of load or introducing power supply where required, and enables Pennsylvania Power and Light Company to utilize the inherent flexibility and reliability of modern unitized substations.

Meeting the growth is the payoff . . . While easily and economically meeting load-growth problems like that at Williamsport, the Pennsylvania Power and Light Company have carried on a tremendous expansion program, adding capacity throughout the system. With changes in electrical demands, it won't be necessary to change their "plan" . . . they'll simply accelerate it or slow it down, as the situation requires. Because of the economy and effectiveness of such planning, this progressive utility has every reason to face new peak loads confidently . . . they're ready to grow and grow!

Westinghouse modern unitized equipment, when installed as an integral part of such a long-range plan, can contribute to the ease, dependability, and economy of your operation. A completely staffed System Planning Service is ready to assist you. Call your nearby Westinghouse Office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

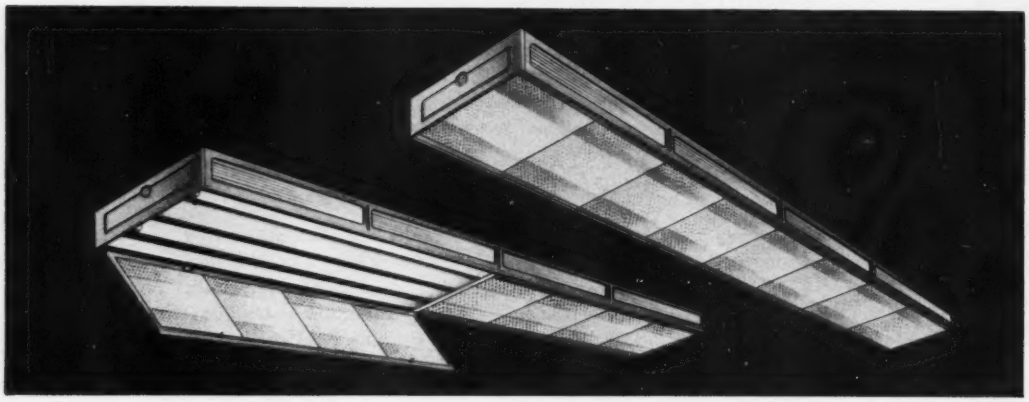
J-97160

Westinghouse

SYSTEM PLANNING SERVICE

Plants at Berkeley, Calif.; Sunnyvale, Calif.; Emeryville, Calif.; Los Angeles; Portland; Salt Lake City; Seattle; Denver

NOW! PLEXOLINE® FLEXIBILITY WITH NEW LOW BRIGHTNESS



HINGED LENS PLEXOLINE®

The introduction of Day-Brite's Plexoline system in 1950 made headline news in the lighting industry.

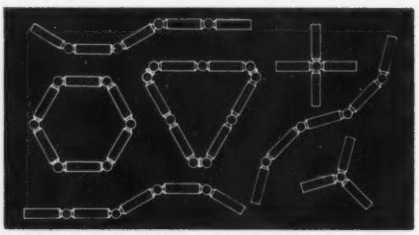
Now Day-Brite announces a new Plexoline development to meet the increasing demand for low brightness luminaires.

The new HINGED LENS PLEXOLINE is a 2-lamp fixture, equipped with Holophane Controlens* No. 9015, fitted into a hinged frame. A separable hinging arrangement allows hinging from either side or complete removal for easy maintenance.

Plexoline Circular Units—Adjustable and fixed accent units with luminous sides.

Available in eight-foot and four-foot sections for Slimline or Fluorescent lamps, the HINGED LENS PLEXOLINE is recommended for surface mounting only and top reflector plates are furnished for 100% direct distribution of light.

*® Holophane Company



HINGED LENS PLEXOLINE is a new addition to the famous Plexoline system. Combined with Plexoline-2 circular units and adapters, this new linear unit permits unlimited lighting patterns — curves, circles, angular patterns, abstract designs — with the most advanced low brightness qualities.

For full information and data on the new HINGED LENS PLEXOLINE, consult your nearest Day-Brite representative or write Day-Brite Lighting, Inc., 5412 Bulwer Ave., St. Louis 7, Missouri.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

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FEDERAL DEVELOPMENT OF KINGS RIVER PROPOSED

Federal development of California's Kings River at a cost of $185,960,000 has been proposed by Secretary of Interior Oscar L. Chapman. The plan calls for building six plants on the north fork of the river and its tributaries, with an installed capacity of 350,000 kw.

The announcement followed the Department of Justice's petition to the Ninth Circuit Court of Appeals to review and set aside FPC's recent action in granting a license to Pacific Gas and Electric Co. to develop a part of the hydro potential on the north fork.

Acquisition and expansion of the PG and E Balch plant is a part of the government plan. It also would install a 45,000-kw power plant at Pine Flat Dam, now under construction by the Corps of Engineers, and would build dams, reservoirs, power plants and diversion systems. With firming assistance from the proposed Central Valley project steam-electric plant (to be enlarged by 90,000 kw as part of the plan) the six plants would produce an estimated output of nearly two billion kilowatt-hours annually, it is stated.

Meanwhile the Kings River Conservation District has sought legal opinion on steps it can take in opposition to both PG and E and the USBR. The district also plans to look into the possibilities of developing the middle and south forks of the Kings River.

● **Announcement** that Interior Secretary Chapman intended to appeal the decision granting PG and E power development rights on the north fork of the Kings River drew sharp response from industry and labor spokesmen in Fresno. Immediate need for power development in the area, facts that the bureau has already delayed this program for two years and that PG and E is ready and able financially to develop the power were some of the arguments put forth.

● **Proposed** $152,000 sale of the 115-kv Omak-Tonasket line by the Okanogan County PUD to the Bonneville Power Administration has been approved by the district's voters.

● **FPC** has terminated an investigation involving hydro projects of four Pacific Northwest power companies, instituted in June 1950 to determine benefits, if any, from storage reservoir or other headwater improvements by another licensee or by the U. S. government. The commission determined that there were no such benefits, and said that cooperation from the four companies and federal agencies concerned eliminated necessity for a formal public hearing. The investigations covered the period from 1931 to the end of 1948. Further study will be made later covering subsequent operations.

Coulee Generators Knocked Out by Workman's Mistake

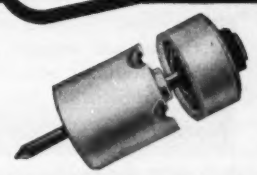
Seven of Grand Coulee's 18 generators were forced off the line when a workman opened the wrong valve on March 14. Resultant flood caused loss of some 700,000 kw to the Northwest Power Pool for a seven-hour period. All interruptible loads were cut off to Kaiser's Mead aluminum reduction plant, the Northwest Alloys magnesium plant and Kaiser's Trentwood aluminum rolling mill. At the aluminum reduction plant two pot lines were kept from freezing by switching the slight amount of power available from one to the other.

The seven generators were knocked out when a workman opened the upper instead of the lower of two 102-in. ring seal valves in an outlet tube at the 1,050 ft elevation on the upstream side of the dam. Water filled valve operating chamber and apparently blew manhole in ceiling, giving water access to longitudinal tunnel above valve chamber. Water went both directions, then down ventilating shafts into turbine pits.

To meet the emergency, Washington Water Power Co. system operators at Spokane lined up a voluntary power reduction program among large industrial customers, bringing about 55,000 kw to help carry the load. Northwest Power Pool operators at Spokane wheeled between 40,000 and 80,000 kw from Montana. Potlatch Forests turned in 4,000 kw of steam-generated power from Lewiston and Cabinet Gorge hydro project contributed 1,800 kw from the stand-by Diesel plant located there during construction activities of Washington Water Power.

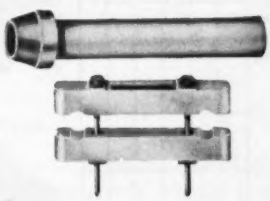
● **General Electric** Co. has granted a 25% wage increase to its employees at the Hanford Works near Richland, Wash., which it operates for the Atomic Energy Commission. The increase is in addition to a 1.08% increase granted in February. Both raises are retroactive to Sept. 17 and have been approved by the Wage Stabilization Board.

...and for LOW VOLTAGE TOO! call Porcelain Products



Dense, good looking, positive gripping ALLIGATOR Nail Knobs are preferred by electricians insisting on workman-like installations to build good-will and repeat business.

Outlet boxes are nationally famous for durability, ease of installation and safety features.



A complete size range of tubes as well as 2 and 3 wire cleats are available for immediate delivery. Made precisely to give long and satisfactory performance.

Both round and oval type split for-estry insulators as well as telephone insulators are available for immediate delivery.

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Porcelain Products, Inc
FINDLAY OHIO

No. 3 in a Series

A STATION ENGINEER ASKS—

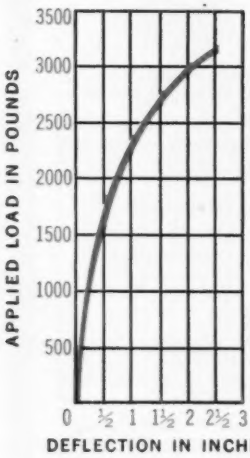
"Why is it necessary to shim 69 K. V. switch units?"

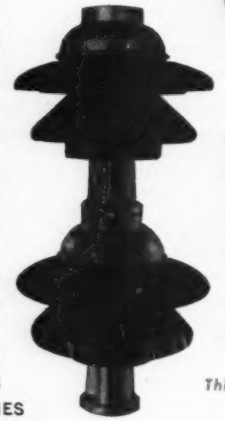
Here's the ANSWER: *You don't have to when you use Pinco L-6069 Switch and Bus Units.*

Here's WHY:

The Pinco L-6069 Switch and Bus Unit employs a ribbed malleable iron pin to give it the rigidity and strength required in this unit's application.

Here's the PROOF: The deflection curve below shows the rigidity of the Pinco L-6069 Switch and Bus Unit under various loads. The secret of Pinco's perfect alignment even when horizontally mounted, lies in the balanced design of the porcelain and hardware.





SPECIFICATIONS

PINCO L-6069 SWITCH & BUS UNIT

Cantilever Strength, upright (Base mounted) 1500 lbs.
Cantilever Strength, underhung (Cap mounted) 1000 lbs.
Torsion Strength ..... 15,000 inch lbs.
Tension Strength 12,000 lbs.

This Unit More Than Meets The Above Ratings

SEE PAGE 116, PINCO CATALOG NO. 49
FOR COMPLETE ELECTRICAL AND MECHANICAL CHARACTERISTICS.

PINCO INSULATORS

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LOS ANGELES FILES SUITS AGAINST CONTRACTORS

Los Angeles Department of Water & Power has filed suits against subcontractors on its Owens Gorge hydro project for a total of $1,128,000. Owens Tunnel Contractors have already filed suit against the department for claims totaling $446,038 and other companies have suits in preparation. The department itself is contractor for the $42 million project.

Defendants in the department suits are Owens Tunnel Contractors, the Stanley H. Koller Co., Southwest Welding & Manufacturing Co., Consolidated Western Steel Corp., Aluminum Co. of America and the Joe Bush Service.

The complaints accuse the firms of responsibility for delays resulting in $1,123,000 worth of damages to the department, for excess costs of $662,000 to complete penstocks on the project and for $343,000 required to repair defective penstock welds.

The department is being charged with misrepresentation of work to be done, unnecessary interference by department officials, breaches of contract and provision of faulty materials.

The development was scheduled originally for completion last year. Current schedule is for power plant No. 3 to begin operating in April, No. 2 in June. No date has been set for No. 1.

● **Kauai Electric** Co., Hawaiian Islands, has purchased the electrical distribution systems of seven sugar plantations and pineapple companies, and consolidated them with its own holdings into a single distribution system covering more than half of the island of Kauai. The company has sold additional common stock and plans a $400,000 bond issue to finance its growth. Originally, Kauai Electric Co. was a wholly owned subsidiary of McBryde Sugar Co. Ownership now is being expanded, but the company still has no generating facilities of its own, buying 80% of its power from McBryde and 20% from Kekaha Sugar Co. The firm has 4,500 customers.

● **Hawaiian Electric Co.** is negotiating for federal land as a site for a new $10 million power plant it hopes to have in operation by 1955. The land site adjoins the present HECO main plant in downtown Honolulu. New installation would increase the company's power output about 25%, according to Louis A. Buese, vice-president.

Where you will find THE REAL REVOLUTION

"If we keep in mind the values of opportunity, competition, democracy, productivity, then it is our capitalist society which is the truly revolutionary one – the only society which offers true hope to the masses for release from the long nightmares of tyranny. It is we, not the Marxists with their reactionary ideas of the good dictator, who have the truly constructive, the truly revolutionary ideal."

– from "Capitalism" by David McCord Wright.

If we can only win recognition of this truth, we shall win the struggle of free men against communism. This editorial discusses some of the hurdles that must be cleared.

To win the needed recognition that "our capitalistic society... is the truly revolutionary one," we must keep pounding away both abroad and at home. That is because the communists simultaneously attack us on an international front and try to undermine us from within.

The present drive to rearm ourselves and our allies is crucial to our self-protection on the international front. We must be prepared to meet the armed force of aggressive communism with armed force if we are to secure our physical freedom.

Arms are not enough

But to re-establish parity in arms is only half of the battle. In the last analysis it is not the more important half. To be effective, our arms must be backed by loyalty of men to our ideals. So, both abroad and at home, we must win men to the faith that we do have "the truly constructive, the truly revolutionary ideal."

On the international front, the effort to win adherence to such faith in our capitalist society meets tough going. That arises from the fact that in some of the countries that are allied with us in the fight against communism, capitalist society has offered to its people no such ideal. In varying degrees "the values of opportunity, competition, democracy, productivity" – those key aspects of American capitalism – are either absent or subordinated in their economic life. Indeed, the *Wall Street Journal* recently remarked that "to the European, capitalism has become synonymous with cartels – and with the disregard cartels foster for the consumer, the worker and the over-all well-being of the nation's economy."

No Simple Solution

Nonetheless, many European labor and governmental leaders sincerely believe that cartels are essential to their economic salvation. They believe that without such restrictions in congested European markets there would be intolerable cut-throat competition and instability of employment. Thus, when we point out that the cartel capitalism so prevalent in Europe lacks the constructive qualities of competitive American capitalism, we may offend European leaders whose wholehearted cooperation we need in the fight against communism.

But, if we soft-pedal that contrast, we sacrifice the opportunity to win understanding and loyalty from millions of Europeans who have had no chance to learn that capitalism can be the constructive and liberalizing force that it is in the United States. Indeed, when many of these millions embrace socialism it is not because they love it. They are rather desperately seeking a tolerable middle course between what they consider the hateful extremes of communism and the undesirable aspects of capitalism as they understand it.

New name not the answer

We know that there is no easy way to handle the problems created by such misunderstanding of American capitalism. Neither do we share the belief that much of the difficulty would be overcome if we were to call American capitalism by some other name. By doing that, the argument runs, we shall relieve it from the unpleasant connotations that are attached to the word capitalism in some other parts of the world. But, after all, if we are to give up all the terms that have come to mean something else in other parts of the world, we must begin by ditching the term "democracy" which, in the official jargon of the Kremlin, seems to mean what we call dictatorship.

In spite of the difficulties, however, we must stick to this job of exporting the truth that our capitalist system does offer opportunity, competition and democracy. We must let the rest of the world see that it means a continuous drive for increased productivity, and the search for profits by increasing sales and consumption, not by trying to sell less for more.

Export alone not enough

The spreading of truth about American capitalism will not be effective if it is merely directed abroad. Unless it is carried on at home also, it will lack the driving faith that is essential to any convincing export of this type. Nor will export alone come to grips with the communist attack on our country from within—an attack that gets too much help from loyal Americans who short-sightedly repudiate the basic principles of our institutions in their efforts to reform some of their deficiencies. For success both at home and abroad, we must have right here at home a much more militant recognition that it is in fact our capitalist society which offers "the truly constructive, the truly revolutionary ideal."

Here at home, too, this raises difficult complications. Businessmen who are among the leaders and principal practitioners of capitalism, have generally been catalogued as conservatives. Hence, many people must stretch their imaginations a bit to see that businessmen are leaders of a development which has so greatly and so rapidly improved the lot of free men in America that it is truly revolutionary.

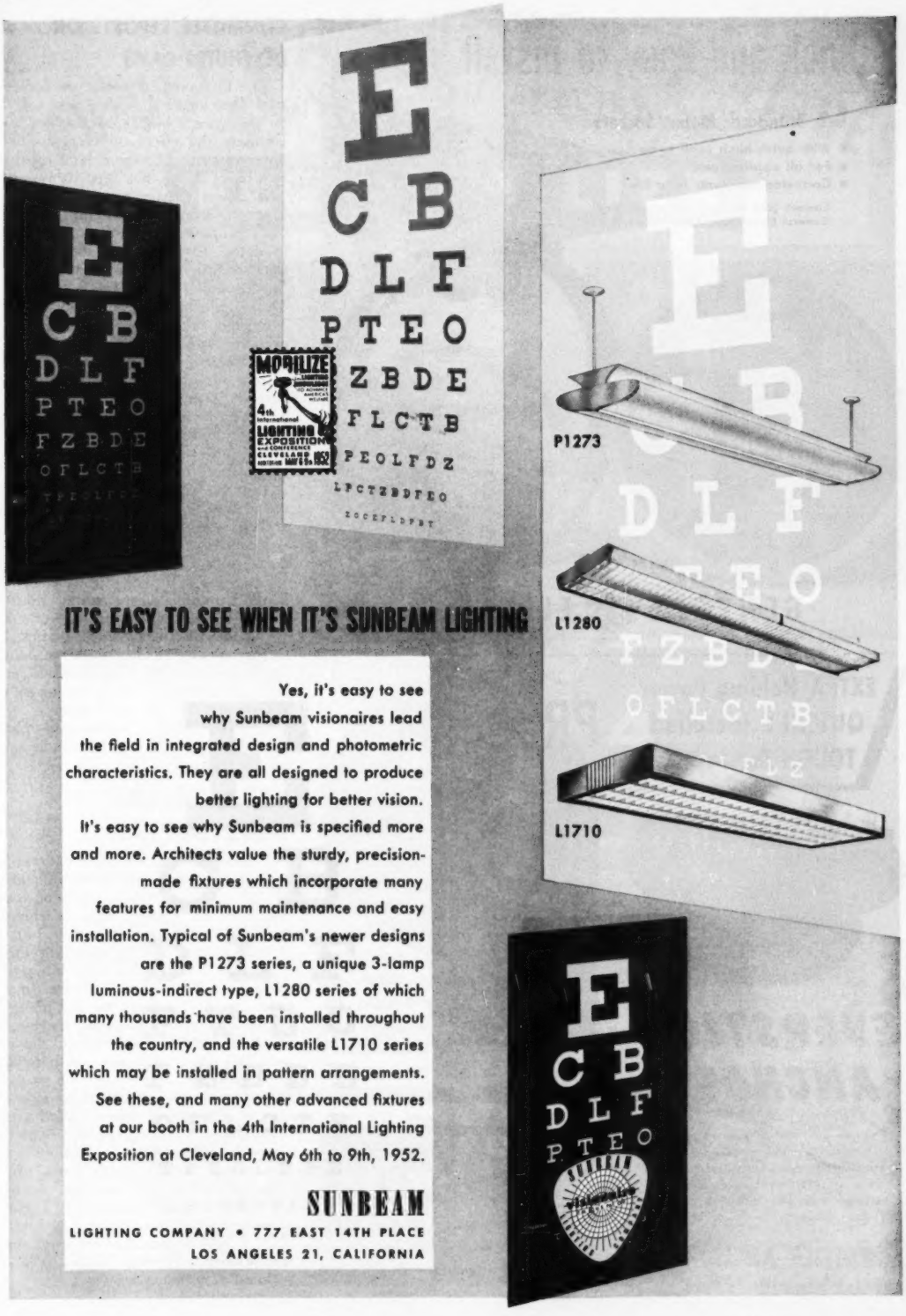
These difficulties of definition, however, are relatively superficial aspects of the problem of seeing our capitalist society clearly. The basic facts are that:

American capitalism is leading free men to an ever higher material standard of living while respecting their spiritual, social and political freedom.

Communism is leading its people back into a life of servile regimentation under dictatorship.

American capitalism advances to high ground never before attained by free men. Communism retreats to ground that men with an appetite for freedom throughout the ages have sought to escape. If we can establish this truth firmly, around the world, we shall no longer need to worry about communism. It will be hopelessly sunk.

McGraw-Hill Publishing Company, Inc.



IT'S EASY TO SEE WHEN IT'S SUNBEAM LIGHTING

Yes, it's easy to see why Sunbeam visionaires lead the field in integrated design and photometric characteristics. They are all designed to produce better lighting for better vision.

It's easy to see why Sunbeam is specified more and more. Architects value the sturdy, precision-made fixtures which incorporate many features for minimum maintenance and easy installation. Typical of Sunbeam's newer designs are the P1273 series, a unique 3-lamp luminous-indirect type, L1280 series of which many thousands have been installed throughout the country, and the versatile L1710 series which may be installed in pattern arrangements.

See these, and many other advanced fixtures at our booth in the 4th International Lighting Exposition at Cleveland, May 6th to 9th, 1952.

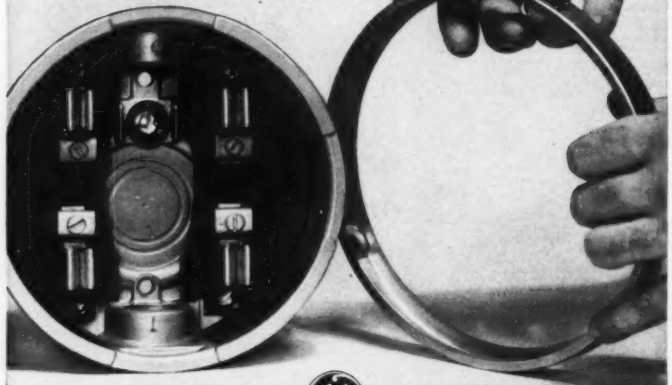
SUNBEAM

LIGHTING COMPANY • 777 EAST 14TH PLACE
LOS ANGELES 21, CALIFORNIA

Quick and Easy to Install

G-E Standard Meter Sockets
- With quick-hitch sealing ring
- For all applications
- Corrosion resistant; long life

Contact your nearest G-E sales office. General Electric Co., Schenectady, N. Y.



GENERAL ELECTRIC

601-84

COMMITTEE REPORTS ON DESCHUTES DAMS

The Oregon Committee on Industrial Development, which was asked by governor Douglas McKay to investigate the effect on Oregon economy of construction of dams on the Deschutes River, has filed its report. The report carries no recommendation on Portland General Electric Co.'s proposed Pelton Dam, but lists in detail advantages of the project, then counters with figures showing the economic value of the fisheries industry, which is opposing the dam.

On the favorable side, the report, prepared by Ivan Bloc, consultant to the committee, concludes that Pelton Dam and its companion project, Round Butte Dam, in addition to proving of benefit to the Northwest power system, would be equivalent to the power demand created by the employment of about 20,000 persons. It lists the value of power to be produced by the projects at between $7 million and $10 million a year.

As against this advantage, the report states that between 2,000 and 3,000 persons are employed directly in the Columbia River fishing industry, and some 6,000 other workers are indirectly involved. The annual income from fishermen workers in the industry in the Columbia River area is estimated at between $6.5 million and $10 million a year.

Governor McKay announced that he would make no recommendation on the report.

Hoist Operator Killed When Ice Block Falls

A hoist operator on construction of Ross power house was killed in mid-March when a 500-lb block of ice fell from the canyon wall, crushing him. The operator, James R. Tharp of Seattle, might have saved his life if he had deserted his post. He was braking a 6-in. steel I beam into place at the entrance to the power tunnel intake, however, and the lives of three men probably would have been lost if he had taken his foot off the brake pedal.

The original schedule for construction of the power house called for cessation of work during the winter because of hazardous conditions in the narrow Skagit River gorge. In view of the power shortage, however, DEPA asked Seattle City Light to work around the calendar. Neither of two deaths that had occured on the project previously could be attributed to weather.

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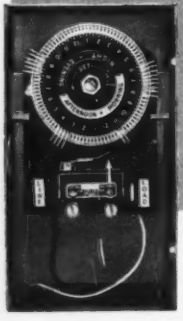

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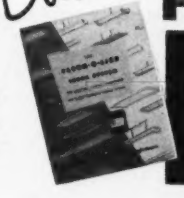

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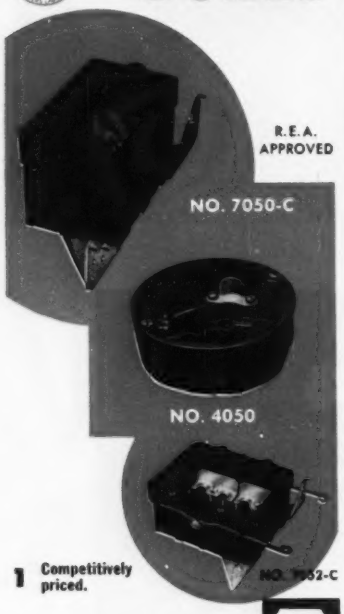

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IDAHO TELLS BUDGET FOR SYSTEM EXPANSION

Idaho Power Co. expects to spend between $55 and $70 million over the next four years to provide additional electric generating facilities, substations and transmission lines.

Part of the financing will be through the sale of about 225,000 additional shares of common stock this summer. The additional common stock will partly finance the current year's construction budget, which has been estimated at approximately $9.8 million, including $3.8 million for the completion of the C. J. Strike hydroelectric generating plant on the Snake River with its related transmission and switching facilities.

The first generator of this project went through test operations the first week in March. The second and third generators will be ready for operation in April or May. The complete power plant will have a peak capacity of 90,000 kw. With the completion of this project, the company's sixth new power plant, Idaho Power will have nearly four times the generating capacity it had in 1945.

Districts Make Plans for Puget Power Purchase

With five of seven Washington state PUDs having given official approval to the proposed purchase of the Puget Sound Power & Light Co., the PUD group is reported to be completing plans for the issuance of $115 million in revenue bonds to finance the purchase.

Kitsap and Skagit PUDs are the most recent to approve the purchase, by a 2-1 vote of their commissioners. Actions of the Thurston, Jefferson and Chelan commissioners had been unanimous.

The two remaining PUDs, Whatcom and Snohomish, have unofficially indicated approval. Snohomish is awaiting the report of a consulting engineering firm, Tudor Engineering Co. of San Francisco, before it votes on the purchase plan. Should it reject the plan, indications are that the Douglas or Mason PUDs would be invited to participate.

It has been reported that the bonds will be sold to John Nuveen Co. & Associates, Chicago, at an interest rate not to exceed 3½%.

● **Clallam County PUD** has decided to build a 50-mile transmission line from Port Angeles to Forks, Wash., rather than attempt to produce power in the latter area. A 69-kv line will be constructed at an estimated cost of $525,000. Most of the power will be obtained from the Bonneville Power Administration.

Fisheries Department Makes Studies in Washington

The Washington state fisheries department has started experiments on the Elwha River to determine the casualty rate among young fish going over hydroelectric dams or through turbines.

It has assembled more than 400,000 fingerlings and yearling salmon of four species at the state's Dungeness fish hatchery on the Olympic peninsula. These fish will be released, under varying conditions, above two Elwha dams during April and May.

One of the dams is 200 ft high while the other is 100 ft high. Both are owned by the Crown Zellerbach Corp. and operated in conjunction with its pulp and paper plants.

Some fish will be sent directly over the dam spillways while others will be sent directly into turbine channels and still others will be left to choose between the two routes. All will be tagged for identification.

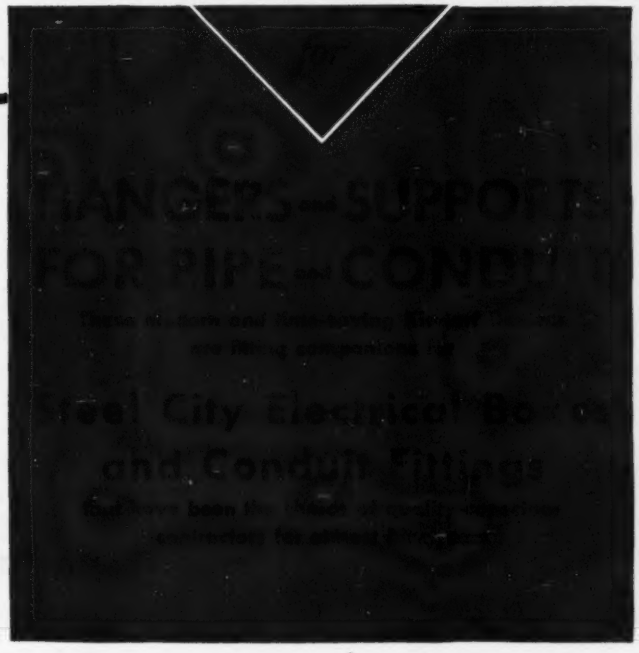
The fisheries department will catch as many of the fish as possible below the dams. These specimens will be examined for injuries, with some of the cripples to be kept for a time to determine the mortality rate among injuries.

B. C. Begins Experiments With Salmon Small Fry

Experiments to determine whether salmon fry can find their way downstream in the face of power projects is to be undertaken in British Columbia. One hundred fifty thousand salmon eggs from Cultus Lake fish hatcheries, another 50,000 from Skagit River, are to be taken to the Marblemount hatchery in Washington. When spring arrives the fish are to be released and allowed to proceed over the 265-ft power dam at Concrete, Wash. Other fish will be guided to the intake of the flumes and fed through the penstocks to the whirling turbines. Arrangements are being made to collect the survivors from both routes for test purposes.

Previous experiments have shown that a considerable portion of the small fry, which are pushed over the dam and run through turbines, escape with little damage.

Meet Contractors' Needs



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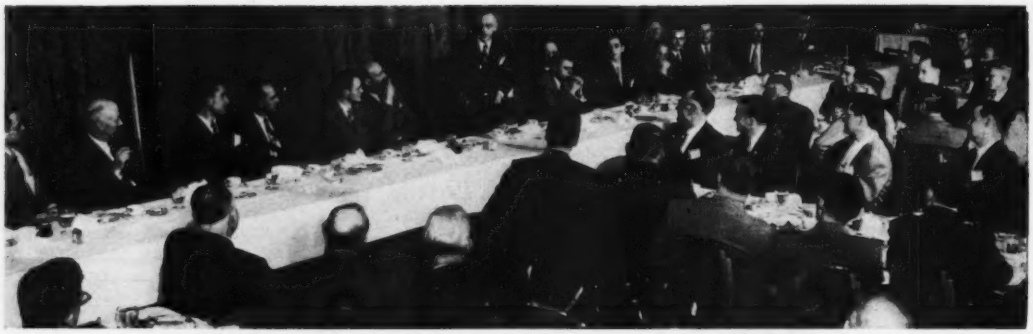

Seattle Section AIEE was host to the University of Washington Student Section at its annual papers meeting on March 4. Seven technical papers were presented, first prize going to Bruce Kieburtz for a discussion of a 4-channel cathode-ray oscilloscope. Shown speaking is Harold E. Wessman, dean of engineering, UofW. C. D. Howe, Pacific Tel and Tel, was chairman of the meeting and John Nelson, Seattle City Light, kept the program on schedule. Joe Hellenthal, Puget Power, oldest past section chairman present and UofW student in 1898, told of the days when the enrollment was 300 instead of 15,000 at Washington

BPA Revenues for Fiscal Year Are Announced

Revenues of the Bonneville Power Administration for the fiscal year ended June 30, 1951, totaled $36,189,028, a record high and 16% above the 1950 figure. Power sales for the year totaled more than 15 billion kwh.

In his annual report Administrator Paul J. Raver credited generally favorable weather conditions, heavy defense power demands and installation of the last generators at Grand Coulee Dam for the record production.

Industrial use of electricity, chiefly by the aluminum industry, accounted for 47.8% of the total revenues, with 27.5% coming from publicly owned utilities, 23.5% from privately owned utilities and 1.2% from other sales.

Net revenues, after expenses, depreciation and interest, totaled $14,495,552, nearly 22% above 1950, bringing surplus net revenues since operations of BPA began to $69,139,613. Cumulative cash receipts allocated to power totaled $216,078,233. This reduced the federal government's investment of $583,245,075 to an unpaid balance of $368,429,456 on a cost accounting basis after transferring $1,262,604 to the continuing fund. Capital repayment was reported 161% in excess of schedule.

In a letter to the Secretary of the Interior, accompanying the report, Administrator Raver recommended installation of 400,000 kw of fuel-fired generation to firm an equal amount of interruptible power. He also "strongly advocated" lines to California and Idaho to firm an additional 220,000 kw of interruptible power.

● **Nearly** 100 former employees of Puget Sound Power & Light Co. will be able to keep their jobs with Seattle City Light, as the result of a city charter amendment approved by a large majority in a general election. Their standing was questioned because they live outside the city, contrary to charter provisions. When Puget Power properties in Seattle were acquired by City Light, employees living outside the city were hired provisionally. The amendment gives them merit-system standing.

● **Requests** for utility rate increases to keep pace with operating costs has caused the California Public Utilities Commission to call for more engineers. The commission said last month it was ready to hire at least five assistant utility engineers and planned a civil service examination to qualify others for future appointment. Applications are to be made to the State Personnel Board in Sacramento.

● **Contract** award for an 80,000-kva autotransformer for Folsom power plant has been made by USBR to the English Electric Co. of Strafford, England, on a bid of $302,912. English Electric submitted the lowest of five bids and was the only manufacturer to guarantee delivery within the 730 days specified. It did not put in an escalator clause.

● **First carload** shipment of pit liner and foundation material for the first of six 34,000-hp 45-ft-head 100-rpm turbines for the Rock Island plant in Washington was made by Allis-Chalmers five weeks ahead of schedule. The manufacturer is also supplying six 25,000-kva generators.

Colorado Utility Plans Construction Program

Some $50.2 million will be spent for construction by Public Service Co. of Colorado. Included are $33.7 million for newly authorized projects and $16.5 million for completion of projects already under way.

The program calls for a new 66,000-kw electric generating unit to be added in Denver in 1953; a 10,000-kw unit for the Alamosa plant in 1953; and an additional 66,000-kw unit for the Denver area during 1954.

Expenditures this year will include $7.3 million for generating capacity; $2.5 million for transmission facilities; and $4 million for distribution lines, services, transformers and meters. About $5.5 million will be spent by the company's gas department.

● **Public Service Co. of Colorado** received the highest of 1951 Freedoms Foundation awards at Valley Forge, Pa., for its efforts to stimulate interest in the early history of Colorado and in the principles on which the state was founded. The prize-winning exhibit was "The Colorado Story," a gallery display of 50 panels carrying the picture story of Colorado from prehistoric man until statehood was achieved in 1876. The panels are mounted on 26 colorful backgrounds, 28 in. wide and 48 in. long.

● **Benton County PUD** will build a $125,000 office building at Kennewick, Wash., according to Manager Owen J. Hurd. The structure, on a 300-sq-ft lot, will include an auditorium and will replace offices at two locations in the city.

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ROEBLING'S research staff is continually working at the job of product development. Our manufacturing facilities and techniques are constantly improved. That's why our Parkway Cable for distribution and general power supply circuits is today even more dependable than ever before.

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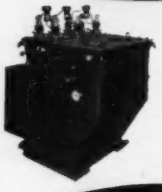

20.8 Kva, 2400 Volts through 750 Kva, 13,800 Volts

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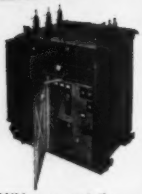

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Career positions with California Public Utilities Commission. Requirements: Degree and two years with utility or allied industry. (Some substitution in qualifications allowable.) Write for full information on salary, opportunities, benefits, etc., to State Personnel Board, Dept. E, 1015 L Street, Sacramento.

DESIGNER, 25 years experience on the Board, development of high voltage switches, mechanical operating and control devices, wants position in any Western state. Has name on four assigned patents. Worked in California previously. Address Box 266, Electrical West, 68 Post St., San Francisco 4, Calif.

NEWS ABOUT PEOPLE

● **Charles F. Mullenbach,** president of Mullenbach Electrical Mfg. Co., Los Angeles, is the first representative of a Western member company to be appointed to the board of governors of National Electrical Manufacturers Assn. He has served on several committees of NEMA and been a member of some of the subdivisions in which the Mullenbach company has manufacturing interests.

● **Carl E. Johnson,** chairman of the board, Sterling Motors Inc. of Los Angeles, was one of two industry pioneers to receive 50-year certificates at the National Electrical Manufacturers Assn. winter meeting, March 10-13, in Chicago. The other recipient was H. T. Bussmann, vice-president, Bussmann Mfg. Co., St. Louis, Mo.

● **W.G. Collins,** protection engineer for the Pacific Telephone & Telegraph Co., San Francisco, has been elected chairman of the general committee of the Joint Committee for the Protection of Underground Structures. He succeeds **Leslie Paul,** supervising mechanical and electrical engineer of the East Bay Municipal Utility District. The committee was formed 30 years ago by representatives of various local organizations and cities interested in formulating and carrying out a program to protect pipelines, cables and other underground structures. Other new officers are **H. C. Snead,** electrical engineer for the San Francisco-Oakland Bay Bridge, vice chairman; **Charles K. Notley,** superintendent of electrical equipment for Key System Transit Lines, secretary-treasurer.

● **W. S. Fleming** has been made executive assistant to **Albert Cage,** president of California Electric Power Co. Fleming started with the company as a senior student in 1922 following graduation from Purdue University. He became merchandise salesman in 1923, merchandise manager in 1927 and sales manager in 1942. He had been special agent since 1949.

● **Herbert H. Horn,** southern California Admiral distributor, will serve another one-year term as Pacific Coast member on the Appliance Industry Advisory Committee of the National Production Authority. He has served on the committee since Jan. 1, 1951.

Andersen

● **Arthur A. Andersen** has been made a vice-president of Rome Cable Corp. In making the announcement, **A. D. Ross Fraser,** president, said that Andersen will continue as general manager of the firm's Torrance, Calif., plant, which manufactures thinwall and rigid steel electrical conduit. In 1946 with his partner, **Ernest M. Carlson,** Andersen began to manufacture metallic tubing at the Torrance location under the name of Andersen-Carlson Mfg. Co. In 1950, the facilities were purchased by Rome Cable Corp. and Andersen was made general manager. Before their association in the Torrance plant, Andersen and Carlson founded and operated the Automatic Screw Machine Co. in the Los Angeles area.

● **Fred D. Harman,** general superintendent of Seattle City Light's Cedar Falls plant, retired on Feb. 1 after 42 years of service. He started with City Light as an oiler at Cedar Falls in 1909 shortly after being graduated from the University of Washington as an electrical engineer. He will retire to a new home near North Bend, Wash.

● **Axel O. Olson,** formerly chief engineer of the San Francisco Public Utilities Commission, has joined the Chicago firm of De Leuw, Cather & Co., engineers, as Western manager. His offices will be at 79 McAllister St., San Francisco 2.

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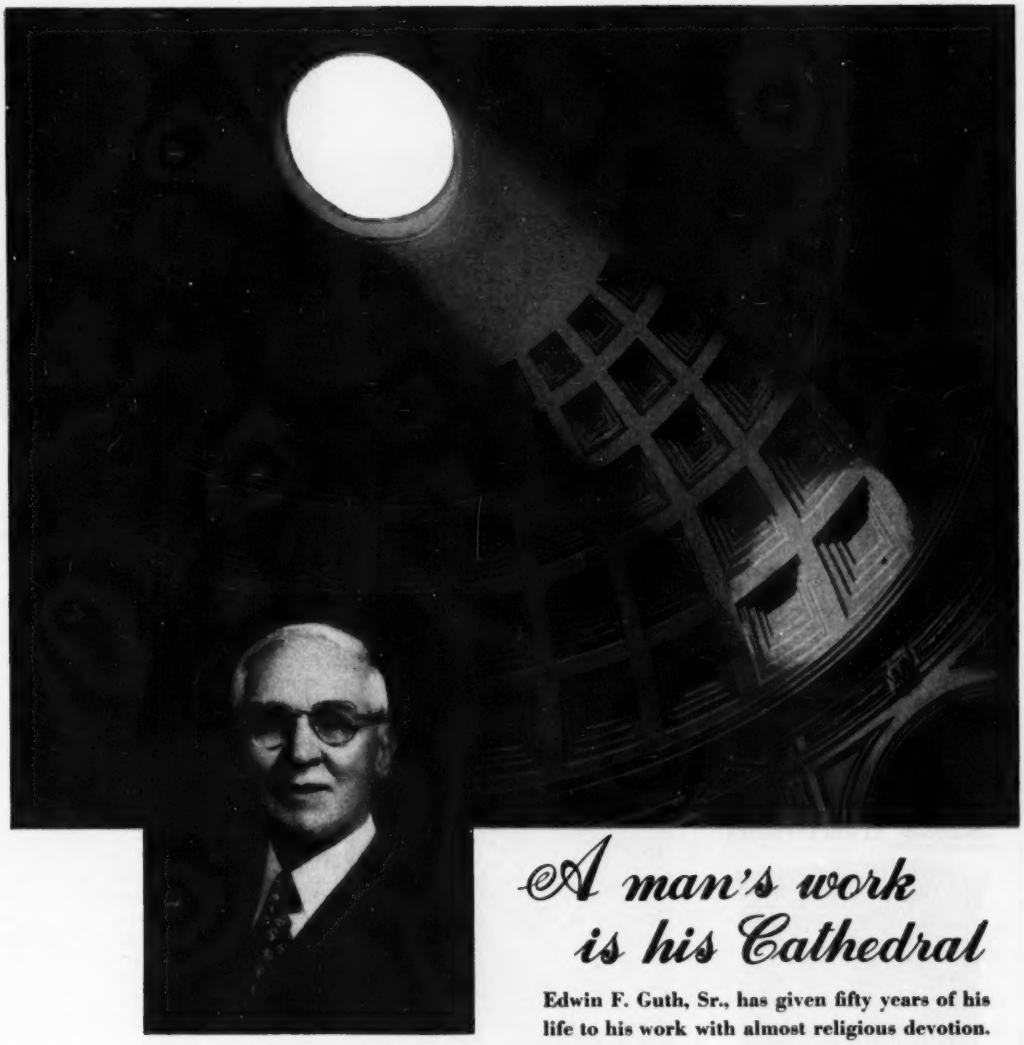

A man's work is his Cathedral

Edwin F. Guth, Sr., has given fifty years of his life to his work with almost religious devotion. His efforts have been rewarded.

His company, now celebrating its Golden Anniversary, is recognized as one of the leaders in the lighting industry. He has achieved fame for his contributions to the betterment of lighting. We at GUTH pause to honor this man who has shaped the past and future of our company.

Thanks, E. F. Guth, Sr. And thanks to all of you who have been so wonderful to us during this past half-century.

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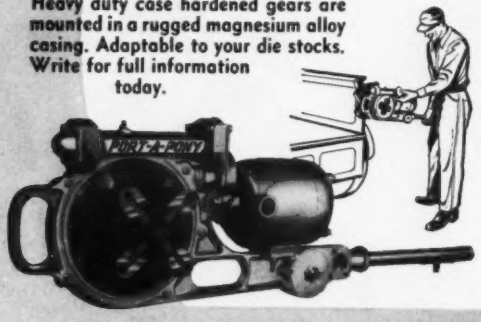
PIPE THREADER

Truly a feather weight, the Port-A-Pony weighs only 26 pounds and is ideal for threading conduit and pipe in the shop or field. Use the Port-A-Pony to thread any ¼" to 4" pipe in place. The ½ h.p. reversible motor operates on 110 volts AC or DC. Heavy duty case hardened gears are mounted in a rugged magnesium alloy casing. Adaptable to your die stocks. Write for full information today.



THREAD-EZY MFG. CO. CORUNNA MICHIGAN

Phillips

● **Ralph J. Phillips** has been appointed to the newly created position of manager of sales for the San Diego Gas & Electric Co., H. G. Dillin, vice president in charge of sales, has announced. In his new post, Phillips will exercise functional control over the various electric and gas sales departments of the company. He is a 25-year employee and has served in a number of capacities with the organization. Immediately prior to the assumption of his new duties, he was engineer in charge of gas sales.

● GEORGE E. LEWIS, who had come from the flamboyant newspaper era of Denver to become manager of the Rocky Mountain Electrical League during its years of strongest sales promotional activity, but who for the past seven years edited *Lines*, the employee magazine and *Home and Community Service*, a bill stuffer leaflet for the advertising and publicity department of Public Service Co. of Colorado, died, aged 63, Feb. 7. Born in Kentucky, Mr. Lewis was schooled in Denver and worked for early day newspapers. He was manager of the league for 23 years during the lushest years of its promotional life; initiated the outdoor Christmas lighting contests that made Denver famous.

● LOUIS DOUAT, manager for many years of Buzzell Electric Works of San Francisco, died after a long illness, March 10. Mr. Douat had long been a stabilizing influence in San Francisco Electrical Contractors Assn. affairs, having served on its directorate and committees, was active in the Northern California Chapter of National Industrial Service Assn.

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25% UPLIGHTING

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30° CUTOFF

STAYS CLEAN LONGER

NO DARK AREAS

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...the 4th International Lighting Exposition in Cleveland (May 6-9).

NOTES ON THE TRADE

● **Maddox Sales Co.** is the successor to Strieby & Barton of Los Angeles at 912½ E. Ninth St. The president is **John Maddox** of San Francisco and the vice-president is **John Maddox Jr.** Secretary-treasurer is **Mrs. J. O. Kajoury.** The firm represents Ideal Industries, Ilsco Lugs, Gleason-Tiebaut Glass Co., for southern California and Arizona areas. The firm is being managed by John Maddox Jr., a University of California graduate, with one and a half years in the Westinghouse training course. John Maddox Sr. continues his factory representation in San Francisco as a separate company.

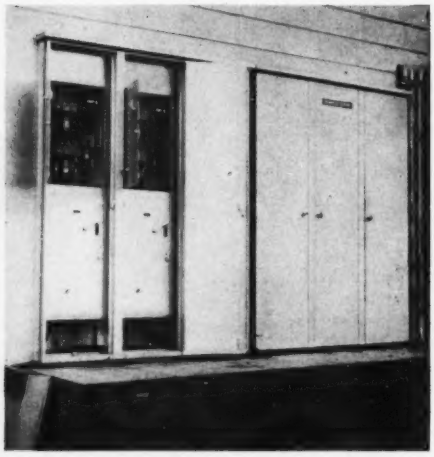
● **Eichorn & Melchior** has announced its appointment as manufacturer's representative for two additional lines. The first is International Rectifier Corp., makers of all types of rectifiers. The other is Struthers Dunn Inc. of Philadelphia, makers of magnetic relays and solenoids. The Eichorn & Melchior firm has a new address at 501 Indiana St., San Francisco. Territory represented is northern California and western Nevada.

● **Gough Industries** has been given the wholesale distributorship in southern California for International Harvester Co.'s line of refrigerators and freezers. These appliances will be distributed from Gough's Los Angeles headquarters and branch offices at Bakersfield, Long Beach, San Bernardino, San Diego and Santa Barbara.

● **Standard Wire & Cable** Co., 9608 Venice Blvd., Culver City, Calif., has been appointed West Coast sales representatives for the Division Lead Co. of Chicago and will handle its line of solder, fluxes, lead, tin, alloys, anodes and industrial chemicals. **I. M. Harris,** Standard's executive partner, made the announcement.

● **Kaemper & Barrett** of San Francisco has appointed **E. F.** (Flynn) **Davis** as sales manager for major appliances. Davis has been credit manager of the firm for almost six years. He succeeds **Preston Cherry,** who will become regional manager for Amana Refrigeration Inc.

● **A Sparton** sales district has been formed in southern California, with **W. R. Brittle** of Long Beach in charge. The district will comprise San Diego, Orange and Imperial counties.



Electric controls operate a smoothly flowing system from storage to icing of cars at the Denver & Rio Grande Western's Denver yards. Picture at left shows a section of the ice dock and part of the pit conveyor and chute. Right, Square D weatherproof standardized control switchboard, one of the two forming an integral part of the system, enabling remote control from the daily storage room or icing machine operator

● **A. J. Macho** has been appointed Western regional manager for McCabe-Powers Auto Body Co., with headquarters at the organization's new office, 428 Latham Square Bldg., Oakland 12, Calif.

● **Sues, Young & Brown** has been appointed exclusive Norge distributor in the greater Los Angeles area.

● **Westinghouse Electric Supply** Co., 905 E. 2nd St., Los Angeles, will distribute the Remington line of room air conditioners. The franchise covers Los Angeles, Phoenix, Salt Lake City and Boise. Remington room air conditioners include window and console models from ⅓ to 1½ hp.

● **N. O. Nelson** Co., 118-22 East River St., Pueblo, Colo., will distribute the 1952 line of Mitchell window-type room air conditioners.

● **Kimball Distributing** Co., 115 S. West Temple, Salt Lake City 1, Utah, will distribute Blackstone washers, dryers and ironers in and around Salt Lake City.

● **Hydro-Sky Lift,** a portable truck-mounted lift, will be distributed in the West by Schetky Equipment Corp., 1810 S. E. 10th Ave., Portland, Ore. The equipment is made by Tey Mfg. Co., Milford, Conn.

● **Philco-Los Angeles,** subsidiary of Philco Corp., has announced its executive management staff. **Walter Ostman,** former manager of the Pacific Mountain district, will be general manager of the new branch, with headquarters at 3631 Union Pacific Ave. **Frank H. Sweeney Jr.** was transferred from Philadelphia as operations manager. **Arthur Pressler** is sales manager, all products, assisted by **Duke MacConaghy,** radio and television, and **Leonard Kercheval Jr.,** appliance division.

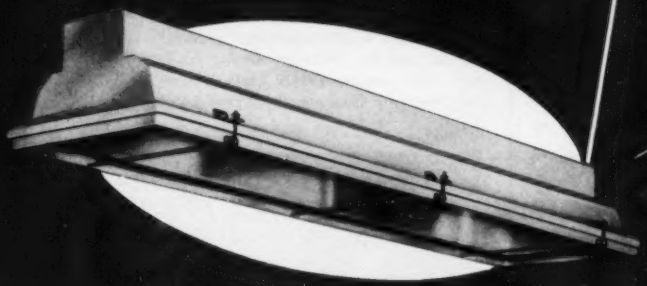
● **Canada Wire & Cable Co.** Ltd. has opened a new plant at 1494 Powell St., Vancouver, and has established a new industry in B. C., manufacturing heavy electrical copper and aluminum wire. E. W. Johnson, B. C. manager of the company, states this is the first time the wire has actually been manufactured in western Canada. James Philip, plant superintendent, is training operators in handling the new machinery.

● **The Midwestern and Western** sales divisions of Thor Corp. have been consolidated and will be known as the Midwestern-Western division. Headquarters will be in the Western Merchandise Mart at San Francisco. **C. D. DuBois,** Midwestern sales manager, will head the new division.

● **Unitrust Products** Co. of Chicago has opened a Western district office at 785 Market St., San Francisco 3, Calif. **D. A. Brownlie** is in charge.

Notes on Quality LIGHTING:

Here in



The New D-P Seal-Line, picture panel, is a recessed fluorescent luminaire built for high efficiency and rugged service under the most exacting conditions.

1 Collegiate Slimline fluorescent
2 D-P Line-Light
3 Constellation Slimline fluorescent
4 Educator incandescent
5 RLM Standard Dome Reflector
6 The Master floodlight
7 LH Ceiling light

ILLUMINATION EQUIPMENT
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA
MADE IN U.S.A.

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PROFILES

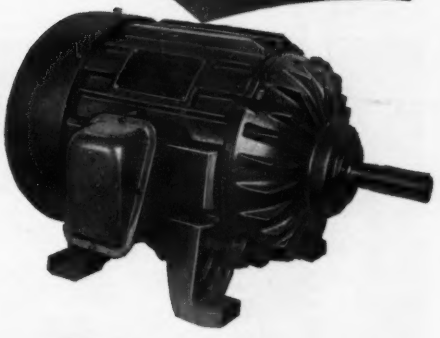
Henry B. Sargent, right, was named president and general manager of Arizona Public Service Co. at the first board meeting on March 3. He held the same posts with Central Arizona Light & Power, which merged with Arizona Edison to form the new company. He will continue to serve as president of Northern Arizona L & P

Al H. Nicoll (right below), Graybar president, a former San Franciscan, congratulates high scorers in the Hotpoint President's Award, J. P. Lawton (center), district manager, Seattle, outstanding Graybar district, and N. A. Hayes, district appliance sales manager (left). They were on their way to a Hotpoint distributors panel

Shown at ground breaking for San Diego Gas & Electric's new Encina plant are: G. P. Evans, Oceanside district manager; E. D. Sherwin, president; L. M. Klauber, board chairman; Mayor J. A. MacDonald of Oceanside. Klauber turned first shovelful

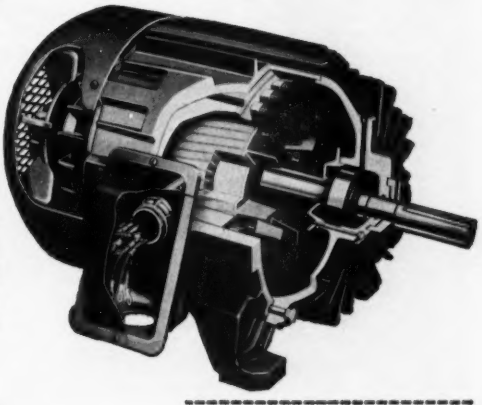
Totally-Enclosed Fan-Cooled MOTORS

Look Outside



Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high, regardless of operating conditions. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can be easily kept clean and cool running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.

Look Inside



Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Die cast rotor and interphase insulation are further assurance of long life and low maintenance.

See WHY THIS IS YOUR BEST MOTOR BUY

HERE IS A MOTOR that is different from conventional TEFC motors; built with an entirely different cooling system that gives you big savings in lower maintenance, more continuous service and less trouble in the toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZ TEFC motor since areas that might collect dirt are exposed and easy to clean.

GET DETAILS NOW — *Ask your nearby Allis-Chalmers Authorized Distributor or District Office for more complete information on this high performance TEFC motor. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.* A-3578

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Applied . . .
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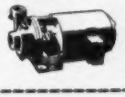
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

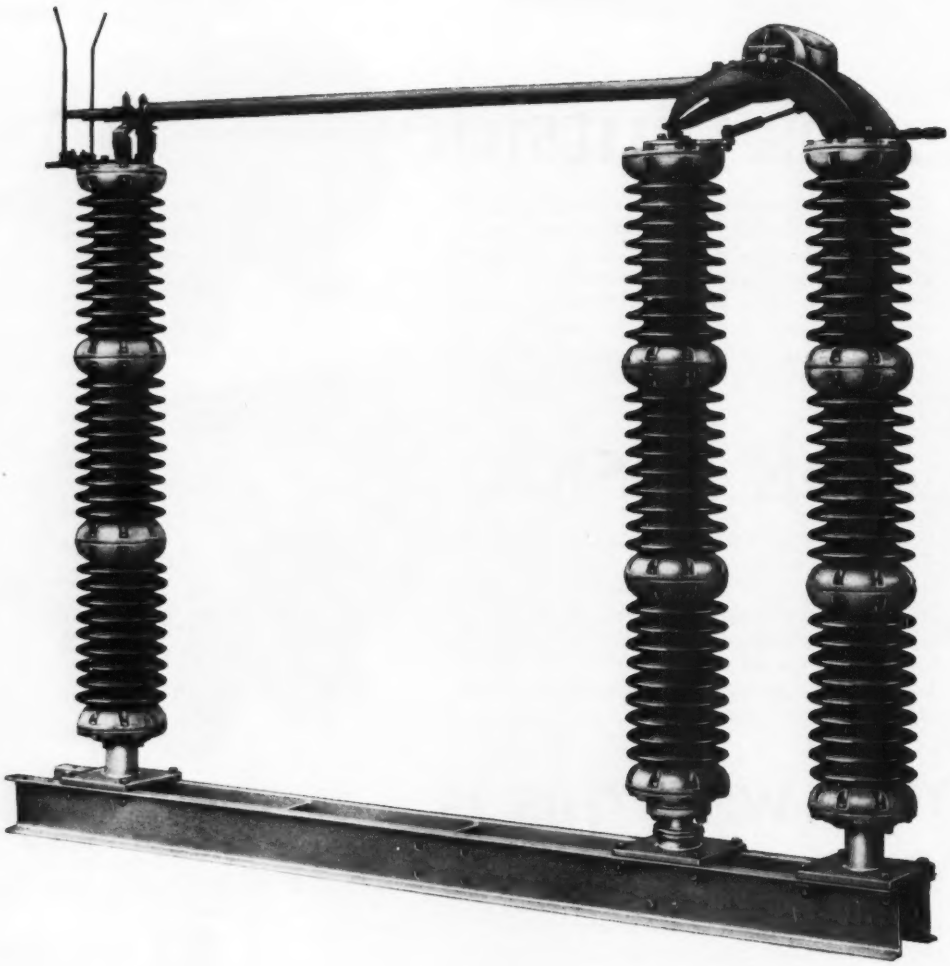
TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Cole Electric Co.

8439 Steller Drive TExas 0-4701 Culver City, Calif.



AIR BREAK DISCONNECTING SWITCH

161,000 Volts—600 Amperes—Type 0-2

Horizontal Mounting—Three Pole—Single Throw—Group Operated

SILVER TO SILVER CONTACTS

One Pole Shown

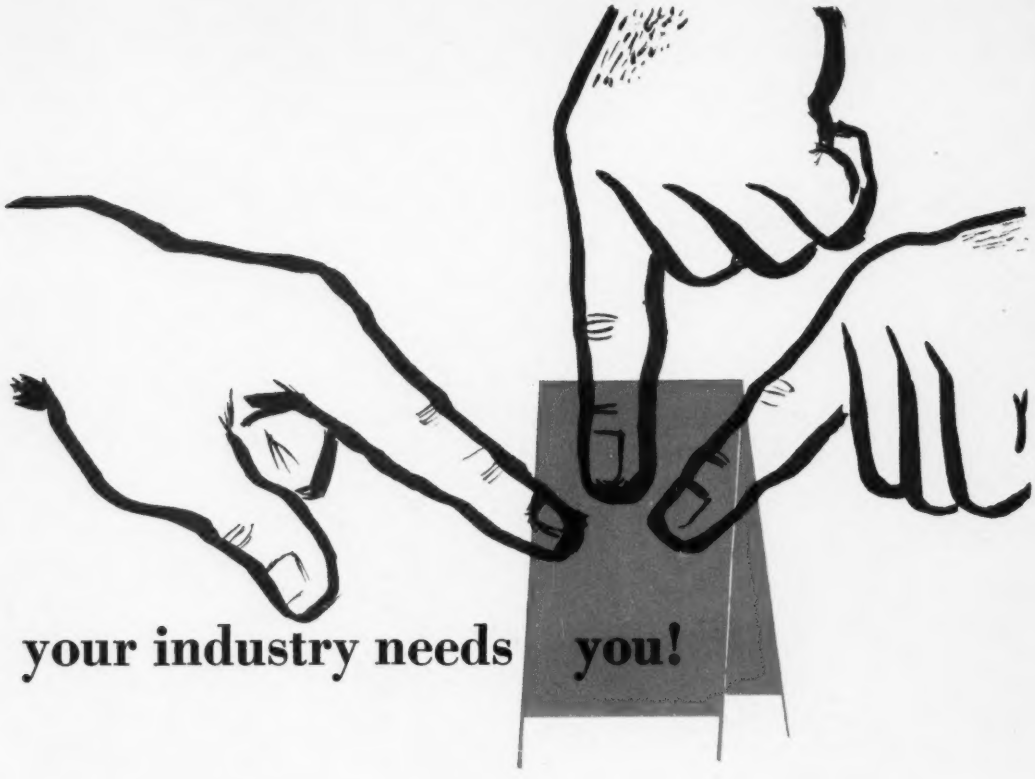
See Bulletin 46A

"From engraving to editorial, our planned lighting really paid off!"

—writes Robert C. Hardie, Publisher of the Marysville Appeal-Democrat

Getting out a newspaper requires plenty of concentration on the part of the whole staff. One way to make the job easier and smoother is planned lighting. Says Robert Hardie, publisher of the *Appeal-Democrat:* "We've found a tremendous improvement in our whole operation since we put in planned lighting. Our main office, engraving and composing rooms are better to work in and produce better work!" Why not survey your plant lighting and learn how better lighting can help you. Call the lighting engineer at your P. G. and E. office, or consult your contractor or engineer.

P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY



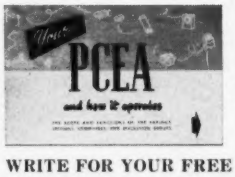
your industry needs you!

Paraphrasing the famous old figure with the pointing finger from recruiting posters isn't so far-fetched because P.C.E.A. does need you, and *is* a good outfit for you to join.

Here in the west, P.C.E.A. is the organization in which members of the electric industry get together to work for the benefit of the entire industry—and it's a "do something" outfit all the way.

There's a definite place for you in P.C.E.A. If you're not a member, you can easily become one, and it's one of the best moves you can make. If you are already one of us, we urge you to take as active a part as you can. In the varied P.C.E.A. program you're sure to find at least one activity especially suited to your interests and talents.

P.C.E.A. has done a lot, and has a lot yet to do. And your help is needed!



WRITE FOR YOUR FREE COPY of the booklet, "Your P.C.E.A. and How It Operates." That's a good way to get started, and now is a good time.

PACIFIC COAST ELECTRICAL ASSOCIATION

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